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AUTHOR Robinson, Halbert B.; And Others
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ABSTRACT

This study was designed to examine the predictive significance of different types and degrees of precocity in preschool children and to assess the effects of participation in a model preschool-kindergarten program operated in conjunction with the study. Extraordinary precocity is defined for this study as performance at the norm for children twice the age of the target child (e.g., third grade reading skill at age four) or performance four or more standard deviations above the mean on a test which permits such estimated scoring (e.g., a Binet IQ of at least 164). Parent questionnaires were also used to identify precocious children. The first section of this report contains a brief history of the project, a first-year progress report, and plans for the future course of the study. The next section includes a description of the sample cohorts, changes in procedures, and data management. Some preliminary findings are presented in the final sections on test-retest reliability, levels of performance, long-term prediction, effects of participation in the model preschool program, patterns of precocity, and school experiences. Extensive appendices describe specific research projects undertaken within the context of the longitudinal study. (JMB)

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IDENTIFICATION AND NURTURANCE OF EXTRAORDINARILY PRECOCIOUS YOUNG CHILDREN

Annual Report to the Spencer Foundation
Granting Period: September 1976 through August 1977

Principal Investigator: Halbert B. Robinson, Ph.D.
Professor of Psychology and Chairperson,
Child Development Research Group

Associate Investigators: Nancy E. Jackson, Ph.D.
Wendy C. Roedell, Ph.D.
Research Assistant Professors
Child Development Research Group

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Child Development Research Group
University of Washington
Guthrie Annex II, MI-20
Seattle, Washington 98195

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Nancy E. Jackson and Halbert B. Robinson

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Wendy C. Roedell

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D. Academic Achievement by Preschool Children
David N. Shorr, Nancy E. Jackson, and Halbert B. Robinson

E. Height, Head and Facial Measurements of Intellectually Advanced Children: Comparison with Current Standards
Mary Ann Sedgwick Harvey, Sterling K. Caarren, and David W. Smith
Dysmorphology Unit, Department of Pediatrics, University of Washington

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Introduction and Overview

This initial section of our report on the longitudinal study of children with extraordinarily advanced intellectual abilities provides a brief history of the project, an overview of who we are, how the study has progressed during its first year, and our plans for the future course of the study. Some preliminary findings are presented in the body of the report which follows this introduction; others are presented in a series of appendices which describe specific research projects undertaken within the context of the longitudinal study. Readers who would like a nontechnical introduction to the project and its preliminary findings may wish to read this overview and then turn to the section describing the extraordinarily precocious children identified by the longitudinal study.

History of the Project

In September, 1976, the Spencer Foundation awarded the Child Development Research Group a three-year grant to initiate a longitudinal study of children with extraordinarily advanced intellectual abilities (Robinson, Jackson, & Roedell, 1976a). This project followed a two-year feasibility study, also funded by the Spencer Foundation (Robinson, 1976). The longitudinal study is the core of several related research and service projects. Some of the children from the longitudinal study attend a model preschool-kindergarten program supported in part by funds from the U.S. Office of Education (Robinson, Jackson, & Roedell, 1976c).

Interactions with the public schools and studies of public school programming for intellectually advanced children have been made possible by a grant from the Ford Foundation (Robinson, Jackson & Roedell, 1976b). Educational services offered within the context of the Ford project include a diagnostic and counseling service for families of children with advanced intellectual abilities[1] and a program of early admission to the University of Washington for junior high or middle school children who are capable of doing college-level work.

Staff

The longitudinal study and related projects are directed by Halbert Robinson, Professor of Psychology and Chairperson of the Child Development Research Group. He is assisted by several faculty members, each of whom has a primary responsibility for one project, although all members of our team collaborate to some extent on all activities of the group. Nancy E. Jackson, Research Assistant Professor, coordinates the longitudinal study; Wendy C. Roedell, Research Assistant Professor, coordinates the model preschool program; and Elisabeth J. Bell, Research Associate, coordinates the program of early admission to the University and activities involving the public schools.

During August 1977 these original faculty members were joined by Research Assistant Professor Sandra K. Mitchell. She will collaborate on a variety of projects, including the development of research related to the early admissions program. Research Associate Gladys Sears joined the project in 1977, as chief psychometrician.

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[1] Those children participating in the diagnostic and counseling service who are five years old or younger at initial contact are also considered as a subsample within the longitudinal study.

In 1976-77, faculty members were assisted by a staff of eight graduate students from the Department of Psychology and the School of Social Welfare. The contributions made by Joseph Fantiglietti (Social Welfare), Richard Krinsky (Psychology), Suzanne Krinsky (Psychology), Terri Macey (Social Welfare), Stephen McClelland (Psychology) and David Shorr (Psychology) are reflected in the research summaries appended to this report. All research activities have been aided by the technical assistance of Charles M. Stillman, a Ph.D. candidate in psychology who has been in charge of the longitudinal data file and many of the statistical analyses. Undergraduate students, primarily from the Department of Psychology and too numerous to mention here, have worked conscientiously and creatively in many research capacities.

The 1976-77 preschool teaching staff working under Dr. Roedell's direction have included head teachers Anne Stratton Hall and Joy Menke, assisted by Anthony Anwukah, Lisa Friedman, Jacqueline Gramman, Claire Leary and Doublas Martin.

Administrative and secretarial services have been provided by Sarah Ainsley and Marti Sivertson, who were assisted by several part-time helpers.

All project activities have been carried out under the guidance of the interdisciplinary faculty of the Child Development Research Group chaired by Halbert Robinson. During the 1976-77 academic year, the Research Group included Associate Professor Philip S. Dale of the Department of Psychology, Professor Ellis Evans of the School of Education, and Associate Professor of Psychology Clifford C. Lunneborg, director of the University's Educational Assessment Center. In the summer of 1977, Professor Benson Jaffee of the School of Social Welfare joined the Research Group.

Goals of the Longitudinal Study

The longitudinal study has been designed to answer both theoretical and practical questions about the nature of intelligence and the best ways to nurture its development. This is the first large-scale longitudinal study in which children with advanced intellectual abilities have been identified prior to their early elementary school years. It is also the first such study to rely on contemporary multi-factor theories of intellectual ability rather than a single unitary index of precocity. In addition, the study is unique in its focus on children whose intellectual abilities are so extraordinarily advanced that they are truly without peers in typical educational situations.

As the children in the longitudinal study sample progress through their school years, they will have a variety of educational experiences. Some will attend neighborhood public schools in a large metropolitan system; others will attend school in suburban or rural communities. Some parents will undoubtedly elect to send their children to private schools. Given the variety of educational opportunities available in the greater Seattle area, the project staff can assume that some children will attend part- or full-time classes for the intellectually gifted. Some children will enter elementary school at an unusually early age and/or accelerate their education while they are in school. Since the children are being identified before they begin school, the longitudinal study will provide a new perspective on the effects of these different educational experiences on children who can be classified in terms of both the degree and the pattern of their intellectual abilities.

Each child's profile of intellectual abilities includes measures of general intellectual ability, spatial-perceptual functioning, reasoning

ability, short-term memory, reading skill, and mathematics ability. Children are classified as being at one of four levels in each of these ability areas. Performance at the norm for children twice a child's age (e.g., third-grade reading skill at age four) or performance four or more standard deviations above the mean on a test which permits such estimated scoring (e.g., a Binet IQ of at least 164), earns the label "extraordinarily precocious." These children have been designated as Group I and are the focal group in the longitudinal study. Three additional groups, designated II, III, and IV, are defined by test performance at lesser degrees of precocity. All of the children in the longitudinal sample are considered to be "at risk" for extraordinary precocity. As the study progresses, a major question of interest will be the predictive significance of each degree and type of precocity. For instance, it should be possible to determine whether preschool-aged children who demonstrate extraordinarily precocious performance on tasks of spatial-perceptual reasoning ability show patterns of later achievement which are different from those demonstrated by children whose early precocity was demonstrated on a test which measures predominantly verbal reasoning ability. Similarly, the data will permit evaluation of the extent to which those children who were extraordinarily precocious during their preschool years maintain their superiority over children whose preschool performance was less remarkable. It is possible that some children whose performance at preschool age is at relatively modest levels will ultimately equal or even exceed the performance of children who have been extraordinary from their earliest years.

Since test performance is often an inadequate index of very young children's intellectual capabilities, the longitudinal study also relies on information from parents. Evaluation of questionnaire information.

yields a rating of A, B or C for each child. The A children are those who, on the basis of information from their parents, seem most likely to demonstrate extraordinary precocity. The B and C groups include children who are judged less precocious on this measure. (See Jackson and Robinson, Appendix B.) These classifications, which are independent of the classifications by test performance, are expected to increase the effectiveness of long-term predictions of intellectual performance.

A subsample of the project children are invited to attend the preschool-kindergarten operated in conjunction with the longitudinal study. Some of these, together with other remarkably advanced students, will ultimately enroll in the accelerated K-12 educational program now being developed by the project staff in cooperation with the Seattle Public Schools, and may eventually enroll in the University through the early admissions program already in operation. Assessing the effects of children's participation in these programs will be one of the major goals of the study.

The development of children participating in all or part of this educational intervention program will be compared with that of other children in the longitudinal study sample whose educational careers have not been directly influenced by the project staff. For some research purposes, it would be ideal if the education of these comparison children were totally unaffected by their participation in the longitudinal study. However, even these children will inevitably have been affected by their family's interaction with the project. For example, participating parents are supplied with summaries of their child's test performance, and it is likely that many parents will use this information in their interaction with school personnel. Some have already done so. The project staff feels that such potentially useful information cannot, in good conscience, be

withheld from parents who wish to have it. All interpretations of differences between subgroups within the longitudinal study sample will therefore have to reflect the fact that every participating child and family has had some experiences which may potentially have affected the child's development and educational experience. In one sense, this is an advantage. Comparisons between children who have been enrolled in the project's educational program and other children in the longitudinal study will measure the effect of the educational program largely unconfounded by any effects of diagnosis or counseling.

Summary of Progress and Future Plans

During the 1976-77 academic year, the project staff devoted its major efforts to standardizing the measures used in the initial assessment, followup testing of the children already in the study sample, defining methods for the collection of information from parents, completing a number of short-term research projects related to the overall goals of the project, and disseminating information about the project to educators, psychologists and the general public (see Appendix A). The results of many of these activities are summarized in later sections of this report.

Plans for 1977-78 include the followup assessment of all existing cases and the identification of a new wave of subjects. We will also be involved in the further development and evaluation of the preschool and University early admissions programs, the design of a public K-12 alternative school for extraordinarily precocious children, continued operation of a diagnostic and counseling service, and the continuation and expansion of basic research and dissemination activities.

Activities currently in progress provide a basis for long-range planning. For instance, the project's program of early admission to the

University, currently operated primarily as a service project, is providing data on the usefulness of a particular assessment procedure in measuring the ability patterns and vocational interests of intellectually advanced children of junior high age. This service also provides the final segment in the integrated, rapidly accelerated program of education which begins with preschool and will soon include a K-12 program.

The Longitudinal Study Sample: 1977

The design of the longitudinal study calls for monitoring the development of a large group of children who might be described as "at risk" for intellectual precocity. These children are first assessed during their preschool years, and some of them manifest extraordinary precocity even at the age of two or three. However, other children in the sample have exhibited only a modest advancement in some aspect of intellecutal growth, and still others have not yet shown any signs of precocity. All of these children do share the quality of being perceived by their parents as intellectually precocious, or of having parents who have sufficient faith in their child's possible precocity to apply to a preschool for intellectually advanced children. The use of such a relatively unrestricted sample provides excellent opportunities for testing the predictive power of measures of intellectual ability taken during the preschool years, while at the same time yielding a high proportion of children who are clearly extraordinary. The primary limitation of the sample is its self-selected nature. Conclusions from this study will certainly apply to a broad spectrum of intellectually advanced children--a much more diverse group than has been included in any previous study--but we will never be able to

claim that the participants are wholly representative of bright children. Certainly, not all parents of bright children would choose to participate in a study such as this.

Description of Sample Cohorts

The longitudinal study sample now consists of three cohorts, or waves, of children. The first cohort (1974-75) was generated by a publicity release in October 1974, and was studied during the two-year feasibility study which preceded the present longitudinal study. Many children from this original cohort are still being followed and they are considered an integral part of the longitudinal study.

The second (1976) cohort was also generated during the pilot study, and consists of children who applied for admission to the 1976-77 preschool program. Since the continuation of the longitudinal study and the preschoo program was still in doubt at the time this cohort was generated, no mass publicity was involved. Thus this cohort differs from previous and subsequent cohorts in that all children came from families specifically interested in having their child attend preschool at the University of Washington. Some of these parents were not aware of the longitudinal study at the time they applied for preschool, and a few of these parents completed the application process even though they did not perceive their child as intellectually advanced.

The third (1977) cohort was generated in the early months of 1977 by the release of information about the longitudinal study and preschool program (see Appendix A). The press release was carried in local newspaper: and resulted in announcements on many radio stations. Special efforts were made to solicit participation from Seattle's black community through

contacts with Head Start programs and other agencies and individuals. The parents of most of the children tested in the 1977 cohort expressed some interest in having their child attend the 1977-78 preschool program, but in many cases this interest was tentative and did not reflect an actual commitment to enroll their child.

All children whose parents returned our parent questionnaire by April 1977 were given an intellectual assessment and considered as part of the 1977 cohort. A few kindergarten applicants were tested even though their questionnaires were returned as late as June.

The data presented in Table 1 summarize the background characteristics of the children who comprise the current longitudinal study sample.

Insert Table 1 here

Changes in Procedures

In the spring of 1977, the project staff decided to extend to 5 years, 11 months the age range within which a child might qualify for inclusion in the longitudinal study sample. Initially, the study was designed to include only those children whose parents contacted the project office before the child's fifth birthday. Experience has revealed, however, that the parents of many extremely interesting children do not contact the project until sometime in the child's fifth year. Most children turn five during the year before they enter kindergarten, and this is the time when many parents of bright children seem to begin seeking advice about how to plan their child's education. Also, the expansion of the Child Development Preschool to include a kindergarten program for the 1977-78 school year has increased

Table 1

Background Characteristics of Children in the First Three Cohorts of the Longitudinal Study

Cohort	N Girls	N Boys	% Firstborn	Median Father's Education Level	Median Mother's Education Level	% Ethnic Minority
1974-75	35	39	76.4[a]	BA	BA	3[c]
1976	27	37	60.3[b]	MA	BA	31.6[d]
1977	29	23	69.2	BA+	BA	15.4

[a]Percentage based on 72 cases.
[b]Percentage based on 58 cases.
[c]Percentage based on 31 cases.
[d]Percentage based on 57 cases.

the project's contact with 5-year olds.

Activities during 1976-77 and the schedule planned for 1977-78 reflect some deviation from the schedule set forth in the original proposal for the longitudinal study (Robinson, Jackson & Roedell, 1976a). In that proposal, parent information was to be used to divide children into groups with differential likelihood of demonstrating extraordinary precocity. While all children in the highest-rated group would be tested, only a sample of children in the other two groups would be tested. This procedure was conceived as a safety valve in the event that the staff was unable to test all children whose parents contacted the project. Selective testing may be necessary in 1978 or 1979. However, the number of preschool applicants and research participants contacting the project before the Spring 1977 deadline was small enough that all children could be tested.

The original proposal called for testing the most precocious children at six month intervals, and other groups at longer intervals. As assessment procedures have evolved, this schedule no longer seems warranted. For purposes of data analysis, it is useful to have comparable data on all subjects in the study. More important, the staff has learned that testing at six-month intervals would yield little useful information and might inconvenience some parents to the extent that their future participation in the study would be endangered. At present, the long-term plan is to test all children in the sample on alternate years through the primary grades and at less frequent intervals thereafter. In years when a child is not being tested, contact with the family will be maintained by mailed questionnaires or telephone calls.

The exception to this schedule will be children involved in the preschool program and their matched controls. Annual intellectual

assessments of these subgroups, and beginning- and end-of-year administration of academic achievement tests and other measures will be necessary for purposes of program evaluation.

The longitudinal study proposal specified that the children enrolled in the model preschool program associated with the longitudinal study would all be Group I children. This was not true in the selection of children for the 1977-78 program and may not be so in future years. Rather the children might be described as falling in Groups I through III, with the great majority being I's and II's. So far it has not been possible to fill the program with children who are classified as extraordinarily precocious at the time of selection.

Most children enter the program at age 3, and very young children are less likely than 4 or 5 year olds to demonstrate extremely advanced performance during a test session. However, experience to date suggests that many of the children who enter the program with relatively modest level of documented precocity will meet one of the criteria for extraordinary precocity while they are attending the school. A more complete description of the preschool selection procedures can be found in the paper on identification by Jackson and Robinson in Appendix B.

Another consideration influencing the selection of children for the preschool has been the project's commitment to maintaining a preschool/kindergarten group which is balanced in terms of the children's age, sex, and racial or ethnic backgrounds.

Another change in procedure has affected the organization of data, though not the composition of the sample. The original proposal called for dividing children into three groups on the basis of test performance, ranging from extraordinarily precocious (Group I) down to a group whose

performance was not substantially advanced (Group III). Children are now being grouped into four, rather than three levels. This procedure allows discrimination between children whose performance is at the level often used to designate a child as gifted (e.g., an IQ of 132) and a more advanced level which falls just short of the criteria for extraordinary precocity (e.g., a child whose Binet IQ falls between 148 and 163).

Data Management

The vast quantities of data which are collected in the course of a large-scale longitudinal study must be handled in some way that will permit ready access for analyses pertaining to particular subgroups and to the sample as a whole, to tests of current hypotheses and tests of hypotheses not yet foreseen. Ideally, the data should be stored in a format which permits their utilization by independent investigators wishing to use the raw data to test their own hypotheses. With these considerations in mind, the staff of the Child Development Research Group have adopted the data management plan described below.

Files have been created and maintained using the SPSS system (Nie, et al 1975). While this system is not ideally suited to the management of longitudinal data, it does have the advantage of being a standard system, accessible to many researchers and including programs for a great variety of statistical analyses. With supplementary options available at the University of Washington, SPSS permits the maintenance and analysis of a data pool including a large number of cases and of variables. The system permits transformation of variables, selection of particular cases or subsamples for analyses, collapsing of variables, and other operations frequently required for this study.

Included in the primary longitudinal file are all measures taken on subjects in the longitudinal sample which relate to questions of long-term interest. The major classes of data now included in this file are summarized in Table 2. In order to provide the complete documentation necessary for present and future analyses, all substantive entries, such as test scores or parent questionnaire responses, are marked with the date at which the information was collected and the child's age at this time. Test scores are typically stored in several forms to permit different types of analyses. For example, the record of a child's achievement test performance includes raw scores, grade-equivalent scores, ratios of age-equivalent scores to the child's chronological age at testing, and a rating of the adequacy of the testing conditions.

Insert Table 2 here

As indicated in Table 2, variables in the primary longitudinal file are defined in terms of time of administration rather than sequential position for an individual case. The inefficiency of such a system is suggested by the blanks opposite some variables for each cohort in Table 2. However, a time-based system permits changes in research procedures as methods are refined with each succeeding cohort.

In this study, procedures such as parent questionnaires and test batteries are constantly being refined on the basis of experience. Thus, the components of Intellectual Assessment 2 differ slightly from those of Intellectual Assessment 1. When we wish to sum across similar procedures we can do so, but the time-based system preserves the identity of each procedure.

Table 2

Organization of the Primary Longitudinal File: September 1977

Classes of Variables	Cohort of Children		
	Pilot (1974-75)	1976	1977
Individual and family background information	A	A	A
Pilot parent questionnaire	A		
Full-Scale Stanford-Binet IQ and related data (administered 1975-Spring 1976)	A*		
Parent Questionnaire (1975 version) responses and ratings of parent information	S	A	
Intellectual Assessment 1 (test battery administered Summer-Fall 1976)	S	A	
Achievement Assessment 1 (Peabody Individual Achievement Test, or PIAT, administered Fall 1976)	S	S	
Longitudinal Classification 1			
By parent information (A,B,C)	S	A	
By test performance (I,II,III,IV)	A*	A	
Parent Questionnaire (1977 version) responses and ratings of parent information		S	A
Intellectual Assessment 2 (test battery administered Spring-Fall 1977)	S	S	A
Achievement Assessment 2 (PIAT administered Spring-Summer 1977)	S	S	S
Longitudinal Classification 2			
By parent information (1977 questionnaire)			A
By test performance (Assessment 2)	S	S	A

A Data on file for virtually all children in cohort.
S Data currently available only for selected cases within cohort.
* Excluding cases too young for testing in 1974-76 and tested as part of Intellectual Assessment 2.

Since the primary longitudinal file necessarily bulges with many variables, including some which are empty for one or more cohorts of subjects we have tried to eliminate from this file any variables for which only a small subgroup of children have data. We have also excluded variables relevant only to short-term focussed research projects or to preliminary analyses such as the computation of inter-rater reliability for a particular measure. Typically, more data are available for the children attending the project's preschool than for the remainder of the sample. We are therefore developing a procedure whereby supplementary files will be created for each year's preschool group. These files will include a readout of the longitudinal file data for these children.

Data describing the children contacted through the project's diagnostic and counseling service have not been included in the primary longitudinal file unless the child's contact with the project has also been as a member of the research sample. Measures collected on counseling cases differ somewhat from those available for research cases; the sample includes children who could not be considered part of the longitudinal study proper because they were more than five years old at the time of initial conatact; and the variables governing the self-selection of cases are undoubtedly different from those operating in the research sample. While data from the two samples will be pooled for some analyses, the identification of individual cases with the research or diagnostic and counseling service sample will be preserved.

Longitudinal Analyses

Test-retest Reliability

A question of central concern in the longitudinal study is the

stability of the measures used for identification of children as potentially extraordinary achievers in later childhood and adulthood. The unreliability of test performance during the preschool years is notorious, and the problem is potentially compounded by this study's reliance on individual subtests, selected from several different tests. Preliminary, short-term results have been encouraging with regard to the stability of most of the measures used.

Table 3 summarizes the test-retest coefficients for children given the longitudinal study screening battery in the Summer and Fall of 1976, and again in the Spring and early Summer of 1977. The only measures showing clearly unacceptable degrees of reliability are the forward and backward digits items from the Numerical Memory subtest of the McCarthy Scales of Children's Abilities (McCarthy, 1972). The coefficient for the short-form Stanford-Binet (Terman & Merrill, 1973, starred items only), Block Design, Mazes (Wechsler, 1967), and PIAT Mathematics (Dunn & Markwar[illegible], 1970) subtests are all at reasonable levels and the reliability of all the reading measures is very high. The analyses include cases in which testing conditions were rated by the tester as detrimental.

Insert Table 3 here

The extremely low reliability of the two components of the Numerical Memory subtest may be inherent in this type of test, which has been described as a measure of attentiveness in young children (McNemar, 1942, cited in Sattler, 1974). It is also possible that some of the unreliability in the comparison between the two testing sessions reported in Table 3 might have resulted from the reordering of the test battery

Table 3

Test-Retest Reliability of Components of the Intellectual Assessment Battery and PIAT 1976-1977

Test	N	Spearman Rank-Order Correlation
Short-form Binet IQ	35	.67**
Forward Digits	28	.35*
Backward Digits	13	.13
WPPSI Mazes	18	.71**
WPPSI Block Design	19	.65**
PIAT Mathematics	16	.70**
PIAT Reading Recognition	25	.96**
PIAT Reading Comprehension	7	.86**
PIAT Spelling	27	.85**

* $p<.05$

** $p<.01$

and the movement of the memory tests from late in the battery to close to the beginning of the session. This change was made in an attempt to improve children's attention to the memory tasks.

Levels of Performance

As indicated in Table 4, there has not been any overall tendency for children's scores to increase or decrease on retesting across an interval of less than a year. This is in contrast to long-term trends, to be discussed in the next section of this report.

Decreases in performance on three subtests of the PIAT, indicated in Table 4, should not be given much weight. Since the test was standardized for children of kindergarten age and older, no norms are available for preschoolers and performance changes over time can only be evaluated in terms of a ratio between the child's performance age and chronological age, as was done in Table 4, or some other procedure which would partial out the expected improvement in raw score over time. Items on the Mathematics, Spelling and Reading Recognition subtest of this test show an abrupt transition from skills which most of the preschool-aged children in this study seem to master very early--letter recognition, counting, and basic number concepts--to actual reading and computation. This qualitative shift in item content sets up a barrier which even many bright children do not cross before kindergarten age. Thus, while the children whose performance is summarized in Table 4 were older at the time of second testing, their raw scores may not have increased past this barrier, or ceiling.

Insert Table 4 here

Table 4

Mean Performance on Intellectual Assessment Battery and PIAT: 1976 and 1977

Measure	Mean at 1976 Testing	Mean at 1977 Testing
Binet IQ (n=35)	137.5	139.4
McCarthy Forward Digits Standard Score (n=28)*	+.87	+.56
McCarthy Backward Digits Standard Scores(n=18)	+.88	+1.35
WPSSI Mazes Scaled Score (n=18)	13.44	13.94
WPPSI Block Design Scaled Score (n=19)	15.16	15.00
PIAT Mathematics Test Age/CA Ratio (n=16)*	1.45	1.34
PIAT Reading Recognition Test Age/CA Ration (n=25)**	1.74	1.58
PIAT Reading Comprehension Test Age/CA Ratio (n=7)	1.72	1.78
PIAT Spelling Test Age/CA Ratio (n=27)**	1.62	1.49

* Wilcoxon Matched-Pairs Signed-Ranks Test, $p<.05$.

** Wilcoxon Matched-Pairs Signed-Ranks Test, $p<.01$.

Long-term Prediction

Since the measurement of intellectual ability during most of the pilot study was restricted to administration of the Stanford-Binet, long-term test-retest comparisons can, at present, be made only for Binet IQ data. Preliminary data suggest that, at least for this variable, long-term prediction can be improved by the evaluation of information from parents.

The parents of virtually every child in the longitudinal study have provided questionnaire and, in some cases, interview information which has been used to rate their child's intellectual ability on a three-point scale. The highest, or A, group includes those children whose parent information suggests the possibility of extraordinary precocity in some realm or other. The B group includes children whose parent information has earned lower ratings, and the C group has the lowest ratings of all. In the spring of 1977, eleven children who had earned Binet IQ's of less than 132 when they were initially tested at the age of 2 or 3 years, were retested. Six of the children had earned A ratings on the basis of parent information, while five had earned C ratings. Retesting of the A group was expected to yield more extraordinarily precocious children than retesting of the C group. Test-retest data are summarized in Table 5.

Insert Table 5 here

The overall gain in test scores probably reflects nothing more interesting than the greater likelihood that older children will be

Table 5

IQ Change in Children Rated High (A) or Low (C) on Parent Information

		Binet IQ at Age 2-3 Years	Short-form Binet IQ at Age 4-5 Years
A Group	Boys	99	130
		124	128
		130	111
	Girls	117	179
		94	149
		127	171
	Mean A	115.2	144.7
C Group	Boys	128	126
		122	141
		98	128
	Girls	124	127
		128	146
	Mean B	120	133.6

more cooperative in a testing session. However, the apparent difference between the A and C groups when retested at age 4 or 5 is intriguing. All three girls in the A group have demonstrated remarkably advanced performance on some measure. Even the girl with the most modest IQ, 149, just missed being classified as an extraordinarily precocious reader. None of the A boys was in any way impressive at the time of retesting and the C group contained no children who demonstrated any extraordinary abilities. As the study progresses and this kind of comparison can be made on larger samples, we hope to demonstrate that evaluation of information from parents contributes significantly to the long-term prediction of intellectual precocity.

Effects of Participation in a Model Preschool Program

The model preschool program associated with the longitudinal study enrolls a total of about thirty children each year. During the 1976-77 school year, eight of the children attending the preschool program were matched for age, sex, and test performance with eight children who had applied to and qualified for the program, but did not attend. The size of the groups involved in this match was limited by the number of matchable controls. Since there was no opportunity to publicize the 1976-77 program, the number of qualified applicants who were potential controls was small.

Since all of the children were initially well above average on measures of both basic intellectual abilities and specific academic achievement, there was no expectation that the preschool program would raise children's test scores, and the program was not designed to stress material related to test content. Therefore, it came as little surprise

when end-of-the-year comparisons on all components of the intellectual assessment battery and subtests of the Peabody Individual Achievement Test indicated essentially no differences between preschoolers and the matched controls.

Naturally, the project staff would not have been displeased if the preschool group had shown substantial gains, relative to the controls, but we are much more interested in the long-term effects of preschool attendance. It would not be surprising if programs for young, intellectually advanced children show a pattern of "sleeper" effects such as have recently been found for Head Start programs ("Research Report," 1977).

Certainly, we can be confident that the preschoolers' academic skills are developing well. From the beginning to the end of the year the group gained about a year in overall achievement test performance. In the fall, the median performance of the group was at the kindergarten level, and individual children's scores ranged from the preschool to the third grade level. By the end of the school year, median performance was at the first grade level, with a range from the kindergarten to the fourth grade level. For a group of 3-, 4- and 5-year-olds, this is substantial academic progress.

Group I: Extraordinarily Precocious Children

While the longitudinal study will provide a wealth of information about a broad range of children who might be described as intellectually advanced, or gifted, the group of primary interest are those who have demonstrated extraordinary intellectual precocity. Extraordinary precocity has been defined as performance four or more standard deviations about the mean, or at the norm for children twice the tested child's age, on any of several measures of general or specific intellectual abilities. To date, extra-

ordinary precocity has been defined by children's performance on the Stanford-Binet Intelligence Scale[2] (Terman & Merrill, 1973), the Block Design and Mazes subtests of the Wechsler Preschool and Primary Scale of Intelligence (Wechsler, 1967) or Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974), the Numerical Memory subtest of the McCarthy Scales of Children's Abilities (McCarthy, 1972), and subtests of the Peabody Individual Achievement Test--PIAT (Dunn & Markwardt, 1970). Typical of cases meeting this criterion would be a child with a Stanford-Binet IQ above 164, or a four-year-old whose reading ability as measured by the PIAT was at the level of the average nine-year-old.

At the conclusion of the pilot project preceding the longitudinal study, eleven preschool-aged children had been identified as extraordinarily precocious. Of these eleven, only seven had been identified through the primary longitudinal study sample, while four had been identified through the diagnostic and counseling service associated with the study. In this report, the distinction between these two samples will be preserved, although children from both subgroups are being followed in essentially the same ways. The summaries reported here include the original eleven cases as well as children identified from the 1977 longitudinal study cohort and the 1976-77 diagnostic and counseling service sample. In addition, the present sample includes several children from the 1974-75 and the 1976 cohorts of the longitudinal study whose extraordinary precocity was not demonstrated until they were retested in 1976-77.

To date, the extraordinarily precocious group includes a total of 24 children, 18 from the main longitudinal sample and 6 from the counseling

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[2]Since the summer of 1976, a short-form (starred items only) version of the Stanford-Binet has been used in all testing done for research purposes only.

sample. The children were all aged 5 or under when their parents first contacted the project office, and their current ages range from 2 through 6 years. Except for one counseling case, all of the children are residents of western Washington.

Patterns of Precocity

As indicated in Table 6, the extraordinary children have demonstrated their precocity in many different ability areas, or combinations of areas. Some of the children have demonstrated consistent precocity in repeated test sessions over a period of several years, while others have performed at extraordinarily advanced levels on one occasion only. The consistency of a child's performance will be one factor taken into consideration as the longitudinal study progresses.

Insert Table 6 here

All of the extraordinary children in the main longitudinal study sample have been tested with the full range of measures necessary to evaluate a child's ability in all the areas listed in Table 3. However, some of the children in the diagnostic and counseling service sample were not given the tests of short-term memory and spatial reasoning ability that would have been necessary to certify precocity in those areas. One counseling case, a two-year-old boy, demonstrated his general intellectual precocity by earning a Stanford-Binet IQ estimated at over 200 on his reading skill by reading fluently from several books. We were not able to test this lively young child's precocity in other areas.

A more comprehensive picture of the interrelationships among extraordinarily precocious children's specific intellectual and academic abilities is

Table 6

Patterns of Extraordinary Precocity
Demonstrated by Children Aged 5 and Under
1974-1977

Area(s) of Extraordinary Precocity	Main Longitudinal Study Sample		Diagnostic & Counseling Sample		Total
	Girls	Boys	Girls	Boys	
IQ only (Total instances = 11)	3	0	0	0	3
Spatial reasoning only (Total instances = 6)	0	3	0	1	4
Memory only (Total instances = 5)	1	2	0	0	3
Reading only (Total instances = 11)	0	2	1	1	4
Mathematics only (Total instances = 3)	1	0	0	0	1
IQ and spatial reasoning	0	1	0	0	1
IQ and memory	0	1	0	0	1
IQ and reading	1	1	0	2	4
IQ, reading and mathematics	1	0	0	0	1
IQ, spatial reasoning, reading and mathematics	0	1	0	0	1
Reading and memory	0	1	0	0	1
Totals	7	11	1	5	24

NOTE: The "total instances" in parentheses under each single ability classification refer to the frequency of extraordinary performance in this classification if children extraordinary in more than one area are counted for each ability.

given in Table 7 which summarizes the test performance of fifteen extraordinarily precocious children tested in the spring of 1977. Not all of the children gave their best performance on all measures in this particular session, but the data do give a fair indication of the range of performance demonstrated by this group. Intercorrelations between measures tended to be modest, statistically nonsignificant, and negative about as often as they were positive. For the measures given in Table 7, Spearman rank-order correlations ranged from +.66 ($n=12$, $p<.01$) for the relationship between Reading Recognition and Mathematics performance to −.70 ($n=9$, $p<.01$) for the relationship between Binet IQ and performance on the backward digits memory task.

It is probable that the restricted range of the sample and the unreliability inherent in the measures (particularly the digits items, as noted earlier) has contributed to the erratic patterns of performance depicted in Table 7. There is evidence, however, that extraordinarily precocious children of preschool age differ reliably and meaningfully in the extent to which their advanced intellectual skills are matched by specific academic achievement. For instance, neither the first nor the ninth child listed in Table 4 mastered any substantial reading skills before beginning kindergarten. Their test performance was consistent with parents' and teachers' reports that these children could recognize a few words, but could not read at a more advanced level than would be expected for any moderately bright 5-year-old.

Insert Table 7 here

School Experiences

During the 1976-77 academic year, four extraordinarily precocious children, two boys and two girls, attended elementary school. Both boys were

Table 7

Spring 1977 Test Performance of 15 Extraordinarily Precocious Children

Binet IQ	Forward Digit Span Test Age/CA	Backward Digit Span Test Age/CA	Block Design Test Age/CA	Mazes Test Age/CA	PIAT Reading Rec. Test Age/CA	PIAT Math Test Age/CA
157	.95	1.43	2.95	1.49	1.32	1.33
179[a]	1.41	1.22	1.72	1.16	2.48	2.41
135[b]	.75	--	--	2.25	1.34	1.29
152	1.43	--	1.68	1.68	1.87	1.52
170[a]	1.50	1.50	--	1.50	2.42	1.41
171[a]	.64	1.18	1.39	1.13	2.00	1.46
157	1.38	1.02	--	--	--	--
150	--	--	1.66	1.17	--	--
167[a]	--	--	1.39	1.32	1.27	1.42
163	1.15	--	--	1.44	1.42	--
152	1.29	1.39	1.50	1.23	2.26	1.54
133	1.30	1.96	1.50	1.43	1.72	1.57
148	1.30	--	1.44	1.37	2.63	1.67
132	1.09	1.64	1.25	1.78	1.98	1.48
140	.89	1.89	1.82	1.11	1.37	1.30

NOTE: Except for IQ's, all scores are ratios of performance, or test age to chronological age. This measure was used for this table to simplify comparison across measures. Blanks indicate a test not given or not scorable in terms of test age. Cases listed in this table include children who had demonstrated extraordinary precocity in previous test sessions but did not do so at this session.

[a]IQ estimated by linear extrapolation above the published norms.

[b]Bilingual child.

diagnostic and counseling service cases, while both girls were part of the longitudinal sample. Their early school experiences may be a harbinger of what other children in the sample will encounter in years to come.

The first girl, A, was one of the original children in the pilot sample for the longitudinal study, and one of the first two children to be identified as extraordinarily precocious, on the basis of IQ. A did not attend preschool, but did enroll at age 5 in the kindergarten program at a private school for intellectually advanced children. During an interview in January 1977, A's mother reported that A was one of the oldest children in her class, and that A enjoyed school and was doing very well. By January, she had gone through several readers, and could "sound out" new words with fair accuracy. A's mother said that she had originally intended to send her daughter to public school, but had not done so because she feared that A would be bored. She plans to continue A in the same private school through the elementary years.

The second girl, B, was also part of the pilot cohort, but did not perform remarkably well when first tested at age 3. When tested again in the middle of her first year at school, she earned an IQ well beyond the scale limits and also met the criteria for extraordinary precocity in reading and mathematical ability. At age 5, B scored at the seventh grade level in mathematics achievement and at levels ranging from the fifth through the eighth grade in reading comprehension, reading recognition and spelling. B entered public school at the kindergarten level, but within two months her teacher had noticed her advanced abilities and, with the support of the principal, moved her up to a combined first/second grade classroom. B immediately began working at the top of her class. By February, B's mother reported that B was generally bored in school, but that she did enjoy science lessons, including the current unit on astronomy.

Although B's mother expressed a philosophical commitment to the principle of public education, and gratitude for her local school's efforts to cope with B's advanced abilities, she had decided by the end of B's first school year to transfer her to the private school for intellectually gifted children mentioned earlier. The director of the private school placed B with a group of older children.

The parents of the third child, C, contacted the diagnostic and counseling service with the request that his intellectual and academic abilities be evaluated so that they could decide whether to request permission for him to skip kindergarten and enter public school at the first grade level. C's test performance qualified as extraordinary in both IQ and reading ability, and the project staff prepared a report recommending that he be permitted to enter first grade at age 5. Personnel at C's neighborhood school felt, however, that the test report was inconsistent with their own observations of C's behavior in his preschool class and during a brief visit to the first grade. Both the teacher and principal described C as a child whose skills were all at, or below, average for his age, with the single exception of his advanced reading ability. They did not recommend placement in the first grade.

According to his father's reports, C's year in kindergarten was a frustrating and nonproductive one, as were his few weeks in the first grade of the same school at the beginning of the 1977-78 school year. At this time, C's family moved to a metropolitan area so that C could attend the private school described above. At last report, C was happily dividing his day between a class of bright children his own age, and a more advanced class of older children.

When the fourth child, D, was five-and-a-half years old, he was brought to the diagnostic and counseling service for the same reason as C. D had

been reading for years and was able to do complex mental arithmetic, and his parents were considering having him skip kindergarten. D's test performance was consistent with his parents' reports of his precocity, and also identified him as extraordinarily precocious in spatial-perceptual reasoning ability. Early entrance to the first grade was recommended by the project staff, and the recommendation was endorsed by personnel in D's school district. A telephone conversation with D's mother in October 1976 revealed that D had quickly adjusted to school and was doing well in the first grade. At last report, D's parents planned to enroll him in a combined second/third grade class for the 1977-78 school year.

During the coming year, many more children from the extraordinarily precocious group will be entering the primary grades. As more children enter more different types of programs, we will begin to get a sense of the educational implications of various patterns of extraordinary precocity, and the effectiveness of different programs. For instance, several of the extraordinary group are enrolled in Seattle's new Horizon Program, a full-time program for children with a broad range of intellectual and other talents. One particularly interesting feature of the Horizon Program is that classes span age levels from kindergarten through the fourth grade.

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APPENDIX A

1. Preschool/Kindergarten Brochure
2. Diagnostic and Counseling Service Flyer
3. News Release
4. Publications and Conference Presentations, 1976-1977

CHILD DEVELOPMENT
PRESCHOOL/KINDERGARTEN

Child Development Research Group
University of Washington
Guthrie Annex II, NI-20
Seattle, Washington 98195

Telephone: (206) 543-4160

STAFF

PROJECT DIRECTOR

Halbert B. Robinson, Ph.D.
Professor of Psychology
and Chairperson
Child Development Research Group

EDUCATION/RESEARCH
COORDINATOR

Wendy C. Roedell, Ph.D.

and

Nancy E. Jackson, Ph.D.

Research Assistant Professors

COMMUNITY RELATIONS
COORDINATOR

Elisabein J. Bell

HEAD TEACHERS

Anne S. Hall
Joy Menke

PROGRAM ASSISTANT

Marti Sivertson

Child Development Preschool Kindergarten

University of Washington

PROGRAM DESCRIPTION

The Child Development Preschool/ Kindergarten is part of a long-term study of the development of children with unusually advanced intellectual abilities. The individualized program is designed to foster optimum development of each child's unique capacities.

A variety of learning experiences are offered in a balanced mixture of teacher- and child-structured situations. The program includes individualized instruction in language arts, science, mathematics, and social studies. Art, music, and drama are also integral parts of the curriculum. Daily outdoor activities allow children to develop self-confidence and coordination in active play. Considerably emphasis is placed on helping children acquire the social sensitivity and interpersonal skills which will allow them to participate comfortably in different social situations.

RESEARCH ACTIVITIES

Since the preschool/kindergarten is part of a research project, children occasionally leave the classroom to participate in individual test sessions. Research activities are designed to be enjoyable experiences for children and are limited so as not to interfere with the classroom program. Parents may decline to have their children participate in any particular activity.

IDENTIFICATION SYSTEM

Applicants are carefully screened to ensure that every child enrolled will feel comfortable in a program designed for children with advanced intellectual abilities. The selection process involves several steps, beginning with the consideration of written information from parents.

Final evaluation of selected applicants is based on a comprehensive profile of the applicant's interests and abilities as reflected in information from parents and scores on standardized tests. Some children qualify for the program by demonstrating generally advanced intellectual ability. Others qualify on the basis of unusually advanced abilities in specific areas, such as reading, drawing, memory, or spatial reasoning.

Final decisions on enrollment reflect the school's need to preserve a balance of ages and sexes in the program, to serve children from diverse ethnic backgrounds, and to enroll a group of children whose superior intellectual talents lie in a variety of domains.

A child must be at least two years of age and toilet trained to be considered for the program. Applicants for each year's program are screened during the spring of the preceding year. Completed applications must be received by March 1 to ensure consideration of a child for the following year's program.

HOURS AND FEES

The morning preschool program, for children ages 2 through 4 years, runs daily from 8:45 to 11:15 a.m. for eleven weeks during the fall, winter, and spring academic quarters. A mid-morning snack is served.

The afternoon kindergarten program, for children ages 4 and 5 years, runs daily from 11:45 a.m. to 2:15 p.m. for three academic quarters. An afternoon snack is served.

Attendance in the full school-day program (8:45 a.m. to 2:15 p.m.) is available as an option for 4- and 5-year-old children. Children bring lunch. Hot soup and milk are provided by the school.

Operating costs of the program are provided by parent fees, supplemented by grants from the U.S. Office of Education and the Spencer Foundation. Fees are determined on a slidin scale based on family size and income. Full-scale fees are $210 per quarter for the morning and afternoon half-day programs, $400 per quarter for the school day program.

TRAINING AND DISSEMINATION

The Child Development Preschool/ Kindergarten is a Model Program of the U.S. Office of Education, Office of the Gifted and Talented. Written materials describing all aspects of the program are in preparation and will be available on request. Visitors are welcome and appointments for observation in the classroom can be made by calling 543-4160.

CHILD DEVELOPMENT RESEARCH GROUP

Diagnostic and Counseling Service

Director:

Halbert B. Robinson, Ph.D.
Professor of Psychology and Chairperson
Child Development Research Group

Address:

Guthrie Annex II, NI-20
University of Washington
Seattle, Washington 98195

Purpose:

The purpose of the Diagnostic and Counseling Service is to help parents of children with advanced intellectual abilities to understand the nature of their children's abilities and to make informed decisions about educational placement. The service is associated with a continuing program of research in child development. It is appropriate for children aged 2½ to 12 years.

Services:

Services include comprehensive testing of a child's intellectual and academic abilities and information about educational options in the Seattle area. Assessment and counseling usually require two or three family visits to the University of Washington campus, but services may be adjusted to meet the specific needs of individual families. Information gained from testing the child and talking with the family is summarized in a written report which is discussed in a final consultation session. Parents may request that we seek input from school personnel or other sources as part of the counseling process.

Staff:

The service is staffed by University faculty and graduate students associated with the Child Development Research Group. All cases are reviewed by the director before the final consultation with parents.

Confidentiality:

All records are confidential. Reports are given directly to parents. Information about a child may be shared with schools or other agencies at the parents' request.

Research:

Since the Diagnostic and Counseling Service is operated in conjunction with a longitudinal study of children with advanced intellectual abilities, parents are asked for permission to have information from their child's records summarized and included in research publications. Such research use of information fully preserves the anonymity of the child and family. Any family may decline, without penalty, to have their child's records included in the research project.

Fees:

The standard fee is $50.00. Fees are adjusted on a sliding scale related to family income.

Further Information:

Questions concerning the Diagnostic and Counseling Service and requests for appointments may be made by contacting Marti Sivertson at 543-4160.

News Services
University of Washington
Seattle, Washington 98195
206/543-2580

FOR EDITORIAL INFORMATION
from
FRED CORDOVA/Manager
in collaboration with
DR. NANCY E. JACKSON
Research Assistant Professor
206/543-4160

Editors, Education and Science Writers:

CHILDREN WITH EXTRAORDINARILY ADVANCED INTELLECTUAL ABILITIES STUDY

What does the future hold for a three-year-old with an IQ of 182 who reads and writes as well as the average nine-year-old? How might such a child's abilities and interest differ from those of another three-year-old who draws detailed and accurate maps of his surroundings and can copy geometric designs as quickly and precisely as the average eight-year-old? What are the chances that either or both of these children will make a remarkable contribution to society?

The answers to such questions are the goal of a University of Washington long-term study of young children with extraordinarily advanced intellectual abilities. This study, now under way at the University, is directed by Dr. Halbert B. Robinson, professor of psychology and chairperson of the Child Development Research Group.

The project is funded by a three-year, $215,000 grant from the Spencer Foundation. The current project is a continuation of a two-year preliminary study begun in 1974. More than 200 families from the Seattle area participated in this project and many are still involved in the research.

Dr. Robinson and his colleagues are looking for children younger than five years of age who demonstrate extraordinary intellectual accomplishments such as those described. The research program involves collecting information from parents by written questionnaires and interviews and testing children for both general and specific intellectual abilities.

Parents who think their child might have extraordinarily advanced intellectual ability are urged to contact the Child Development Research Group if they are interested in participating in the long-term research project. The telephone number for the project office is 543-4160. Callers should identify themselves as parents responding to this information item.

In their everyday behavior at home, young children might display extraordinary intellectual ability in achievements such as talking in sentences before the age of one year, reading fluently at the age of two or three,

taking apart and reassembling complex mechanical objects, and so on, explained Dr. Robinson. As an example, he cited one child, whose development has been followed for the past several years, who had an unusually extensive vocabulary and an extraordinary memory as early as age two. By the age of twenty-eight months, she had memorized most of a guidebook to American birds and, during a trip to the Seattle zoo, was highly indignant to learn that the purple martin and tufted titmouse were not included in the collection there. Two years later, this child has taught herself to read and enjoys reading such books as Charlotte's Web and The Little House in the Big Woods.

At present no one is certain of the long term implications of extraordinary intellectual precocity in the preschool years, according to Dr. Robinson. As the project continues, Dr. Robinson and his colleagues hope to keep in touch with the families of children who have shown different types of extraordinary abilities and record the children's intellectual, social, and personality development up through their early years in school. If research funds continue to be available, some of the children will be followed into their adult lives.

Several service programs are associated with the research project. A total of thirty children, aged two through five years, are enrolled in a model preschool for intellectually advanced children supported by grants from the U. S. Office of Education and the Spencer Foundation. The Child Development Research Group also offers a diagnostic and counseling service for families of children aged three through twelve who are concerned about educational planning for their intellectually advanced child. This service is supported by fees and a grant from the Ford Foundation.

Under the auspices of the UW Graduate School, the Child Development Research Group is based in Guthrie Annex II on campus.

Dr. Robinson, faculty member since 1968, is a 1951 graduate of Stanford University with master's and doctoral degrees, also from Stanford.

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3/15/77

Identification and Nurturance of Extraordinarily Precocious Young Children

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APPENDIX B

1. Early Identification of Intellectually Advanced Children
   Nancy E. Jackson and Halbert B. Robinson

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Early Identification of Intellectually Advanced Children

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Abstract

The identification system described in this paper is being used in an ongoing longitudinal study of young children with advanced intellectual abilities. The system is used to select children for a model preschool/kindergarten program as well as to provide data for the longitudinal study. Identification procedures include the administration of a test battery including a short-form Stanford-Binet IQ test, plus tests of spatial perceptual reasoning ability, short-term memory, mathematical skills, and reading ability. Parents' responses to a partially open-ended questionnaire also contribute to the identification process.

While identification systems must reflect the needs of individual programs, data from the longitudinal study suggest the following guidelines: Children should be given diverse opportunities to display a variety of intellectual skills; a child's best, rather than average, performance should be the primary selection criterion; and, children's parents should be encouraged to contribute their observations to the identification process.

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Early Identification of Intellectually Advanced Children

Child Development Research Group
University of Washington

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Nancy E. Jackson and Halbert B. Robinson

Introduction

The Longitudinal Study and Model Preschool Program

The Child Development Research Group at the University of Washington is currently engaged in a longitudinal study of children with advanced intellectual abilities. We are particularly interested in those few children whose abilities are so advanced that they meet our stringent criteria for classification as "extraordinary,"[1] but we are also following many more children whose performance at this time is less extremely precocious. By identifying, during their preschool years, a group of children who might be described as "at risk" for extraordinary intellectual ability, and following these children to adulthood, we hope to determine the long-term significance of various constellations and degrees of ability which are manifested early in life. We also hope to monitor the success, academic and social, of particular types of children in particular school settings.

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[1] Extraordinary precocity in a specific intellectual domain or general intellectual ability is defined by test performance at least four standard deviations above the mean (e.g., Stanford-Binet IQ of 164) or above the norm for children twice the child's age.

The identification system described in this paper is an integral part of our longitudinal study. It must serve our long term goals of providing comprehensive data about the intellectual abilities of bright 2-5 year olds which can eventually be compared with measures of their performance at later ages. Thus, we operate under unique constraints such as the need to use types of measures which span broad age ranges and to include measures which have theoretical as well as practical significance.

We are, however, also faced with the practical problems associated with operating an educational program for intellectually gifted young children (see Appendix A). In conjunction with the longitudinal study, we run a model preschool-kindergarten program for 30 children between the ages of 2 and 5. We have many more applicants than places in the program, and each year we must screen applicants as efficiently as possible in order to identify those children with the most advanced abilities in one or more intellectual domains and also to insure that we obtain a reasonable mixture of children on such important variables as age, sex, and cultural background.

Justification for Early Identification

Experience with early intervention programs for intellectually precocious children has, as yet, been too limited to permit evaluation of the long-term effects of such programs. However, current widespread interest in preschool, kindergarten and early elementary level programs for intellectually advanced children has been inspired by evidence that

all bright children do not necessarily do well in school and life (see, e.g., Hollingworth, 1942) and by the observation that many remarkably productive and successful gifted people seem to have benefited from very early identification and nurturance of their gifts (Cox, 1926; McCurdy, 1957; Hauck & Freehill, 1972).

In our own experience thus far, we have been struck by how often the school system can accommodate a child with unusually advanced abilities, if the appropriate personnel are given a chance to learn of these abilities. Thus we are convinced that early identification of children's abilities is important, even when a specific program, such as our own preschool, is not available (Jackson, Krinsky & Robinson, 1977).

Identification by Standard Test

General Considerations

Any attempt to identify intellectually advanced young children on the basis of standard test performance should take into account several guiding principles. First and most important, all testing must be done with the understanding that one can be confident of whatever abilities a child does demonstrate during a testing session, but a young child's failure to demonstrate advanced performance does not necessarily indicate lack of advanced ability. The distinction between "can't" and "won't" is often impossible to make, and no young child should be dismissed as "ungifted" on the basis of test performance alone.

One's chances of obtaining instances of advanced performance from a young child are increased if a testing session includes several independent opportunities for a child to perform on a variety of types of task. We operate with the assumption that a child's performance on a test battery composed of varied parts should be evaluated, not in terms of average performance, but in terms of that child's best performance. If a three-year-old reads fluently but earns a Stanford-Binet IQ score of only 100 or 120, the advanced reading is much more informative and important than the failure to demonstrate advanced performance on the Binet. Similarily, a three-year-old who performs like a seven-year-old on tests of spatial ability but whose vocabulary scores are average for his or her age is a very different child from one whose performance is slightly above average on both types of tasks.

Finally, any instruments chosen for testing should include enough difficult items to allow for differentiation among children who are performing at the upper end of the scale. Bright children may perform like average children unless they are presented with sufficiently challenging material.

Measures of General Intelligence

We use a short form (starred items only) of the Stanford-Binet Intelligence Scale (Terman & Merrill, 1972 norms edition) as a measure of general intellectual ability for young children in our longitudinal study and for preschool screening pruposes. We have also used the only other general intelligence scale standardized for children

as young as two and three, the McCarthy Scales of Children's Abilities (McCarthy, 1972). However, our experience with a small sample of 21 preschoolers indicated that, while the McCarthy correlated reasonably well with the Stanford-Binet ($r = .75$), this test did not differentiate among very bright children as well as did the Binet. An indication of this is that the mean Binet IQ for the group was 134.5,[2] while the mean McCarthy GCI was only 117.5. We also found that the McCarthy was much more time-consuming to administer than the short-form Binet.

We have also tried, and rejected as a screening instrument, the Peabody Picture Vocabulary Test--PPVT (Dunn, 1965). This test is widely used to provide a quick estimate of general intellectual level, and studies reported in the literature indicate that, at least for middle class samples, it provides an adequate approximation to a more comprehensive test such as the Binet. However, our data suggest that the PPVT, like the McCarthy, is limited in its ability to differentiate among children of the highest ability levels. During the 1975-76 academic year, the Stanford-Binet IQ scores of 17 children in our preschool program were compared with their PPVT IQ scores. For the group as a whole, the correlation (Spearman rho) was a moderate .49. However, if the children were split at the median Binet IQ, the correlation between Binet and PPVT scores was +.83 for the lower-ability group, but only +.27 for the higher-ability group (Shorr, McClelland & Robinson, 1977).

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[2]Administration of the WPPSI (Wechsler, 1967) to a subsample of 11 children who were old enough for this test indicated that IQ levels were concordant for Binet and WPPSI.

The administration of the short-form, rather than the full-scale Binet saves enough time to permit us to include a variety of other measures in a single screening session of approximately one hour. Generally, the short-form Binet takes only 30-40 minutes to administer, compared with 50-60 minutes for a full-scale Binet. Analysis of our own data has been consistent with previous studies (see Sattler, 1974) in indicating that the items included on the short-form yield an IQ score which is a good approximation of the score obtained from the full test. When 91 full-scale Binets administered in the pilot phase of our longitudinal study were rescored as short forms, the mean of the group was essentially unchanged (IQ of 128 for the full scale, 127 for the short form) and in 20 per cent of the cases rescoring did not produce a change at all. . In 85 per cent of the cases, the difference was less than plus or minus five IQ points.

While the rescoring analysis does not account for effects of sequence and total testing time which are involved in the actual administration of the two different forms, these data suggest that this short-form Binet deserves serious consideration as a time-saving alternate to the full-scale Binet or another general intelligence test.

Measures of Specific Intellectual Abilities

In accordance with the conviction that a test session should provide children with varied opportunities to demonstrate the best performance of which they are capable, and consistent with current consensus among most psychologists that intellectual abilities are plural rather

than singular (e.g., Bock, 1975; Broverman & Klaiber, 1969; Smith, 1964; Matarazzo, 1972) we include other measures, in addition to the short-form Binet, in our standard screening sessions. The Binet has often been described as heavily loaded with items that test verbal knowledge and verbal reasoning ability, somewhat to the exclusion of spatial-perceptual abilities. Therefore, our test battery includes the Block Design and Mazes subtests of the Wechsler Preschool and Primary Scale of Intelligence, or WPPSI (Wechsler, 1967). Since the beginning of 1977, we have adopted a policy of continuing on to the parallel subtests of the Wechsler Intelligence Scale for Children-Revised, or WISC-R (Wechsler, 1974) whenever a child exhausts the most advanced items on a WPPSI subtest. ...To date, the most advanced performance we have recorded on these subtests was that of a five-year-old who earned a WISC-R Block Design score at the norm for fifteen-year-olds.

The Block Design and Mazes subtests were chosen as measures of spatial perceptual reasoning ability because these tests have been identified in previous studies as loading heavily on a spatial-perceptual factor and are similar in content to tests loading on spatial ability in older children and adults (Eliot & Salkind, 1975; Sattler, 1974) and would seem to require less fine motor skill than some other tests of spatial-perceptual ability. If we dealt only with children aged four or five and older, we might have chosen the Geometric Design subtest of the WPPSI rather than the Mazes Subtest, but success on this test requires a degree of drawing skill that is beyond most of our youngest children.

We have been satisfied with the use of the WPPSI/WISC-R Block Design

and Mazes subtests for identifying advanced spatial-perceptual ability in children aged 3½ and above. We have extrapolated downward from the published norms to provide estimates for evaluating the performance of children aged 3 years, 4 months and older. However, we are still considering other instruments to measure the spatial-perceptual skills of the youngest children in our sample. We may adopt the Preschool Embedded Figures Test (Coates, 1972) or the Sequin Form Board (Stutsman, 1931, 1949) for this purpose. We had originally rejected these tasks as too easy for the three- and four-year-olds in our preschool, but they might be very appropriate for differentiating among two-year-olds.

The Block Design and Mazes subtests have been administered to several separate subsamples from our preschool and longitudinal study, and our findings are consistent with the hypothesis that spatial-perceptual ability can be identified in young children as an ability separate from the abilities tapped by the Stanford-Binet. The data from three independent subsamples are summarized in Table 1.

Insert Table 1 about here

Note that, in all three groups, the correlation between the spatial measures and Binet IQ was at the expected low level. However, the predicted strong correlation between the two spatial-perceptual subtests was evident only in the second sample. We are not now able to explain this apparent independence of Block Design and Mazes performance. However, since the

correlation has not been consistently high, we will continue to use both subtests and for screening purposes, to consider each individual child's best performance as our preferred measure of spatial ability.

In addition to the short-form Binet and the Block Design and Mazes, our screening battery also includes the Numerical Memory subtest from the McCarthy Scales of Children's Abilities (McCarthy, 1972). We include these tests of short-term memory for forward and reversed digit sequences because of our theoretical interest in these tasks, rather than from any strong conviction that the measures contribute valuable information to a screening battery designed for practical purposes only. We know of no evidence that these measures, taken alone, identify skills which predict a need for, or success in, a program for intellectually advanced children.

When we are trying to get a comprehensive picture of a child's abilities in a single test session, we estimate mathematical competence from the "Block Counting" item at Year VI on the Binet and the "Making Change" item at Year IX. If a child succeeds in counting accurately on the Year VI item, the Binet items are supplemented by more advanced items on the Arithmetic subtest of the WPPSI. Also included in our screening session is a makeshift, one-page reading inventory which gives us an estimate of whether the child can recognize letters or simple words, or read more complex words and sentences.

When time permits, we use the Peabody Individual Achievement Test (Dunn & Markwardt, 1970) to measure preschooler's academic skill levels in a separate testing session. Although this test has been standardized only for children of kindergarten age and older, we have found it to be easy to administer to bright children as young as three. Furthermore,

research within our own sample and in an unselected control group suggests that this test is sensitive to individual and age differences among bright children at the preschool level (Shorr, 1977).

A surprising number of preschool-aged children are substantially advanced in their academic skills, particularly reading. Certainly, not all bright preschoolers are advanced readers or mathematicians, but those who are can be easily identified. A child whose most advanced skill happens to be reading should not be denied the opportunity to demonstrate this skill as part of the comprehensive assessment of his or her abilities. Whether a child is being considered for a special preschool program for gifted children or for some individualized program within the publice school mainstream, it is important to know that an entering kindergartener has reading recognition skills at the twelfth grade level, or mathematical abilities at the sixth grade level. Such extraordinarily advanced skills may be uncommon, but our own experience has demonstrated that they do exist.

Synthesis of Test Information from a Comprehensive Battery

When children are screened for a program on the basis of their performance on a single instrument, it is possible to compare them on the basis of a single score. When a test battery composed of diverse components is used to make decisions which must ultimately be unidimensional--which children will be accepted in the program, which excluded--there must be some way of synthesizing the child's performance so as to permit comparative judgments without losing the benefit of the varied information in the battery. Our solution has been to

devise a point system which gives a child credit for advanced performance on any measure, and to set our minimum standards of acceptance so that a child whose performance is unusually excellent only on one measure will not be excluded. Our final decisions in selecting children for our preschool program reflect our desire to include children with different types of abilities.

Limitations of Identification by Test Performance

Any test session, no matter how comprehensive, provides only a limited sample of a child's behavior, and that sample may not include the best performance of which the child is capable. The often-cited unreliability and lack of long-term predictive validity of standard tests administered at the age of two or three years has been demonstrated again in our own research. The test scores of very young children are often depressed by their unwillingness or inability to sit still and pay attention to the test items, or by their reluctance to give extended verbal responses to a stranger. We have frequently had the frustrating experience of overhearing a two-year-old demonstrate his or her mastery of extensive vocabulary, complex sentence structure, and advanced conceptual understanding in a conversation with a parent prior to a testing session, and then being unable to elicit more than a few monosyllabic responses to test questions, despite the best efforts of our experienced and skillful testers. One partial solution to this problem is to give a child some credit for any advanced skills observed during an interview or test session, no matter how informal the context in which the skills are displayed. Another partial solution is to weight the child's test performance according to the tester's judgment of the adequacy of the

session.

Nonetheless, the best way to compensate for the limitations of a test session is to look beyond the session and ask parents to describe instances of their child's best intellectual performance. Parents have a unique opportunity to observe their child's behavior for extended periods of time in varied circumstances. The use of information from parents can do much to compensate for the unavoidable limitations of any standard testing program. Evaluation of information from parents is a major component of our identification system, and we strongly recommend that parents' reports play a part in any system for identifying young children with advanced intellectual abilities.

Identification by Parents

Background

Several investigators have found that parents are more accurate than classroom teachers in identifying those primary grade children who will score highest on standard intellignece tests (Ciha, Hoffman & Potter, 1974; Jacobs, 1971; Ryan, 1975). Many elementary level programs for gifted children now use some sort of questionnaire to collect information from parents about their children's abilities, interests, and personalities, and include this information in their identification process. Our own experience during the first three years of our research in this area has confirmed the usefulness of information from parents, but our results so far have indicated that it is difficult to collect this information on a brief, objective questionnaire which can be scored simply by counting yes-no answers or values on a rating scale.

Our first questionnaire was adapted from a standardized interview protocol, the Developmental Profile (Alpern & Boll, 1972). Parents' responses on the "academic" and "communication" subscales of the first questionnaire correlated +.37 and +.40 with the children's Stanford-Binet scores, for a pilot sample of 72 children. While these correlations are statistically significant and certainly nontrivial, they nonetheless account for relatively little of the variance in IQ scores. Furthermore, we discovered that when these questions were administered as a questionnaire, rather than in the intended interview form, parents on the whole showed an overwhelming positive bias in their responses. Indeed, by following the formula for estimating an Academic Quotient, or approximate IQ, given in the instructions for the interview protocol, we obtained an estimated quotient of 156 for our sample of 73 children. Considering that the mean Stanford-Binet IQ of this group as tested was a much more modest 126 (N=70), it seems reasonable to conclude that, even allowing for depression of some test scores because of detrimental test conditions, the parents' responses were excessively optimistic.

Since this initial effort at involving parents in the identification process, we have developed and revised a questionnaire specifically designed for differentiating among high-ability young children. Preliminary analyses of objective responses to our most recent questionnaire (see Appendix B) suggest that we are now able to make somewhat better predictions of test performance from questionnaire scores. However, the correlation between questionnaire scores and test performance is still

lower than we feel it should be for a practical screening instrument. Part of the problem is undoubtedly one of questionnaire construction. One needs to be incredibly precise in specifying a question so that parents, particularly parents who want to have their child included in a popular program, will be likely to answer the question the authors of the questionnaire had in mind. For instance, many parents of preschoolers assume that a question about whether a child "reads" certain kinds of books must refer to whether the child listens to these books being read by an adult, or likes to study the pictures in the book. In our most recent questionnaire we asked the following question:

"Is your child able to read a simple book, such as Hop on Pop, or other kindergarten level books, and recognize most of the words?

__11__ Yes __3__ I think so __8__ I don't think so __50__ No, not yet

(__1__ no answer)

From parents' comments and the children's test performance, our impression is that this question worked quite well. That is, parents answered the question that was asked, and tended to be sure of their answers. On the other hand, we also asked the following question:

"Does your child read books such as Winnie the Pooh, which contain long stories and few pictures?

__16__ Yes __3__ I think so __6__ I don't think so __45__ No, not yet

(__3__ no answer)

Sixteen parents answered "yes" to the more advanced question, whereas only 11 had answered yes to the leas advanced question, and their comments on the questionnaire, it was clear that at least some of these parents assumed that we could not possibly be asking if their preschooler

actually [illegible] such books. [illegible]

[illegible] read [illegible] question

could actually read such books. Not surprisingly, only a few of the children whose parents answered "yes" to this advanced reading question demonstrated in our laboratory the advanced skill that would be necessary to read books such as Winnie the Pooh.

At present, we minimize the difficulties of designing an objective questionnaire which will reliably differentiate among children with above-average abilities by giving parents ample opportunities to describe, in their own way, examples of their children's accomplishments and interests. Members of our project staff then use this anecdotal information, together with the parent's objective responses, to make their own estimates of the child's ability in several intellectual domains. We have found that these ratings contribute more than do simple totals of objective responses to the identification process. The ratings show substantial correlation with the child's test performance at the same age, and perhaps more important, improve our ability to make long-term predictions about the child's performance a year or more later.

The Richness of Parents' Anecdotal Reports

Descriptive information from parents provides a picture of a young child's behavior which could not possibly be duplicated in any summary of test performance statistics, no matter how high the child's scores might be. We have been consistently delighted with the willingness and ability of parents to describe what their child is like. For instance, one parent wrote the following:

> By the age of two, Alice could identify all colors, including shades, could count to ten, had begun "spelling" road signs by naming the letters, could identify all letters of the alphabet by names, and spoke in sentences of up to ten words, using all basic parts of speech. She now (at 28 months) speaks in sentences of up to sixteen words and uses complex sentence structures; for example, this morning she has said "I'm trying to figure out where I left my dancing shoes." and "I want to take a look at this story to see what kinds of boys and girls it has in it." . . . Alice has memorized most of Birds: A Guide to the Most Familiar American Birds and recognizes the common ones we see frequently; at the zoo she identified the kingfisher, bald eagle, vultures and owls from having seen them in the book and was indignant over the lack of a purple martin and tufted titmouse . . . Alice got her first books when she was six months old and they immediately became her primary interest. She now has over a hundred books and has learned most of them by heart. . . .

Other parents describe their two-year-old's passion for doing 100-piece jigsaw puzzles in his crib with the lights out, and a five-year-old's independent discovery of a system for multiplying two-digit numbers by breaking them down into simpler components and summing the products of the components e.g., $17 \times 17 = (10 \times 10) + (7 \times 7) + (7 \times 10) + (7 \times 10)$. His mother commented that he preferred using this system to the tedium of memorizing the multiplication tables beyond 10.

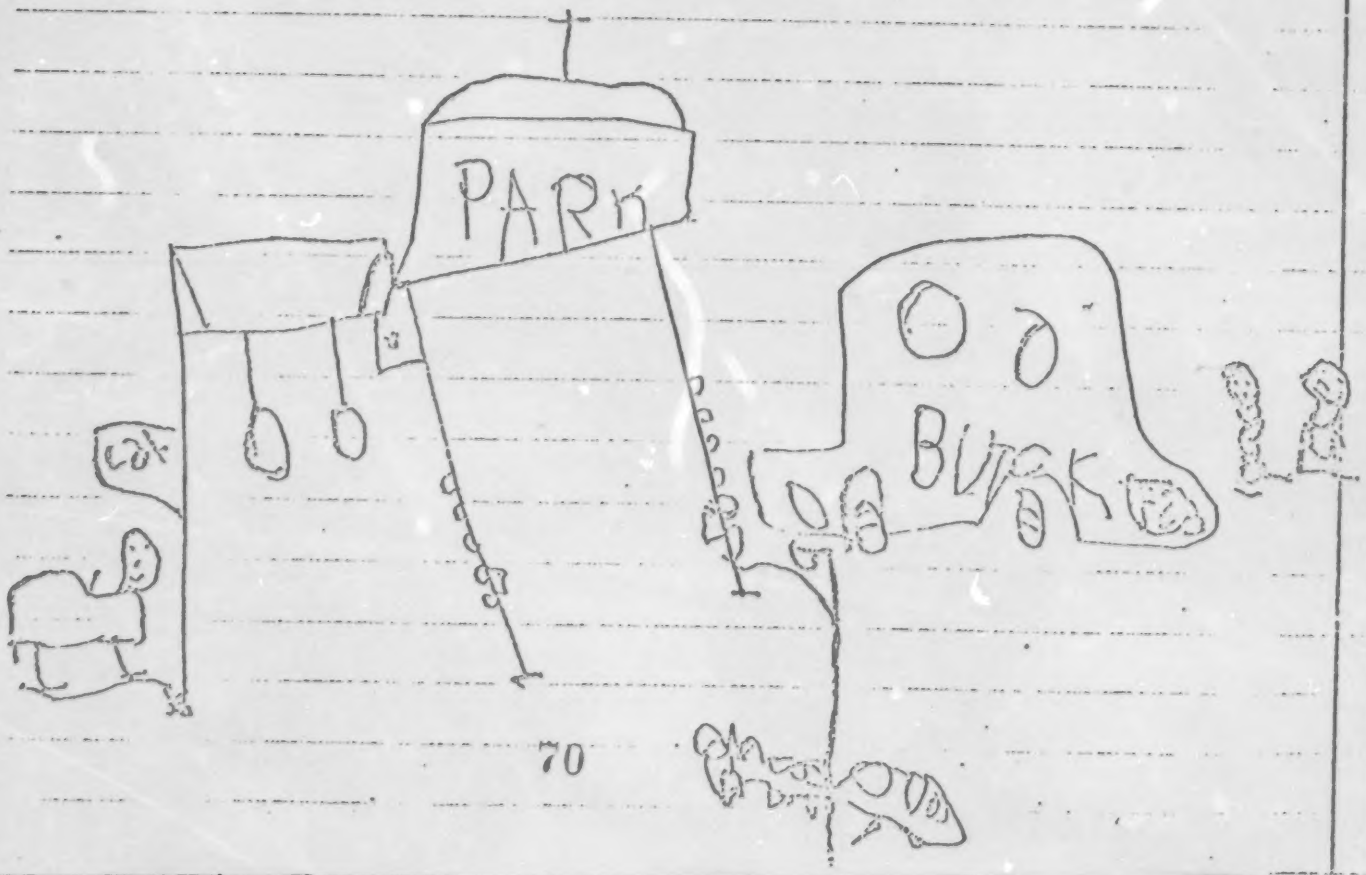
The questionnaires we now use encourage parents to provide extensive anecdotal information by asking some questions which call for only an open-ended response, and by providing ample space for comments with those questions which ask for specific responses. We also encourage parents to include examples of their children's artwork or writing with their completed questionnaires, and some of these contributions are among our most cherished data. Examples of some of the drawings which we were able to reproduce in black and white are shown in Figure 1.

Figure 1

Examples of Children's Art Submitted by Parents

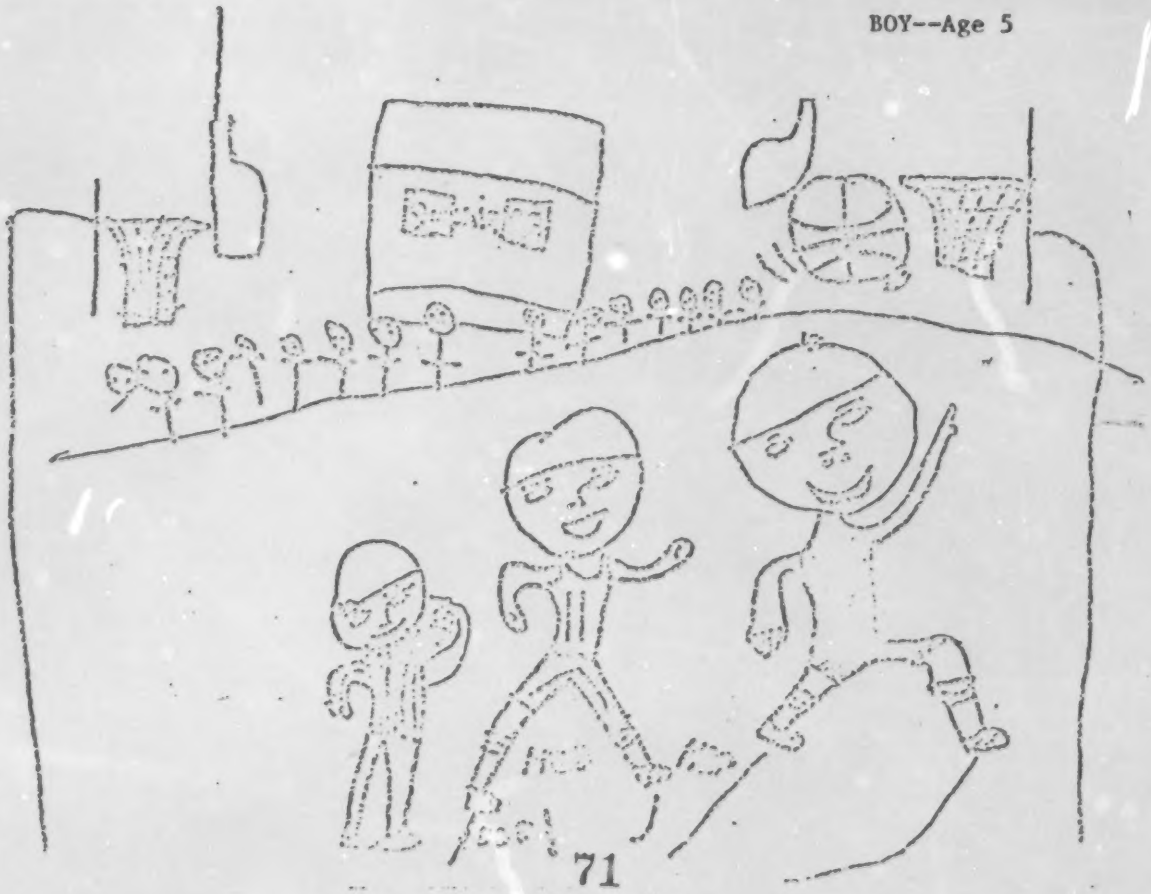
GIRL--age 3

BOY--Age 3



BOY—Age 4
(Drawn freehand from reference book)

BOY--Age 5



Insert Figure 1 about here

Anecdotal information serves several purposes. As mentioned earlier, parents' comments provide an excellent opportunity for staff members to validate their objective questionnaire responses. More important, these remarks permit parents to describe their individual child's particular strengths in ways that could not possibly be anticipated by the most comprehensive objective questionnaire, and to provide the details which permit us to distinguish an interest from a passion, an emerging skill from a virtuoso accomplishment. For instance, in response to our question, "Does your child recognize and name two-digit numbers?" one parent responded "Yes, he only starts losing track when he gets into the 10,000's."

The primary limitation of a system which relies on anecdotal information is that the system is undoubtedly biassed in favor of conscientious and articulate parents who have the time and the inclination to write at length about their child's activities.

Rating Parent Information

All our ratings of parent information are done on a three-point scale ranging from average (0 points) to advanced (1 point) and extraordinarily precocious (2 points). Raters code information from parents on several intellectual dimensions. In 1975 and 1976, parent information was coded to rate the children in terms of language ability, memory, and

spatial perceptual reasoning ability, plus an undefined "other" category. More recently, questionnaire information has been rated on the dimensions of language, memory, conceptual understanding, spatial/perceptual reasoning, reading, and mathematics ability. We are still evolving a set of rating dimensions which can be used reliably and which divide parents' responses into empirically verifiable factors. Results thus far indicate that when the raters are reliable in scoring a dimension such as spatial-perceptual reasoning ability, their ratings are effective in identifying those children who score high on tests of that ability. For example, in the 1976 preschool screening sample, ratings of parent information describing children s spatial ability predicted spatial test performance, but not performance on the Stanford-Binet. Conversely, ratings of language ability predicted Binet performance but not performance on the spatial reasoning tasks. The results of these analyses are summarized in Table 2.

Insert Table 2 about here

Unfortunately, this finding was not replicated in our 1977 screening sample. Prediction of reading ability was excellent and prediction of mathematical ability was moderately good but the raters were unreliable in scoring the other intellectual dimensions and their ratings did not predict test performance. We suspect that the failure to replicate was due to a combination of factors: relatively inexperienced raters, doubling the number of dimensions on which ratings were made, redesigning the

the questionnaire with questions in random order rather than separately grouped and identified as belonging to a particular domain. Analyses of the 1977 data now in progress, including factor analyses and multiple regression analyses of the relationship between questionnaire items and test performance, will be used to clarify what dimensions should be used for the rating of parent information about children's intellectual behavior.

Although our attempts to predict performance on particular types of tests from ratings of particular kinds of behavior have had only mixed success, the rating system has been resoundingly successful as a tool for identifying those children most likely to perform well overall in a standard test session. In the 1976 screening sample, ratings of parent information from both questionnaires and interviews correlated +.58 (n=39)[3] with the children's Stanford-Binet performance. In the 1977 sample, total rating points for parent information correlated +.69 (n=48)[3] with a summary score for the child's test performance (Binet plus specific ability tests). Furthermore, while the two independent raters judging the 1977 sample were not consistently reliable in rating childrens' precocity on individual intellectual dimensions, they were highly reliable in their overall ratings.

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[3]Spearman rho, both values highly significant

Parent Information as a Long-range Predictor of Intellectual Ability

Although the correlation between parent information and a child's concurrent test performance is high, there are some cases in which the two types of information give widely discrepant pictures of a child's abilities. Occasionally, a child whose parent report is totally uninspiring will surprise us by demonstrating very advanced performance on the tests. Some parents are undoubtedly too modest about their children's accomplishments, others are simply too busy to give the kind of detailed accounts which impress our raters, and a few simply haven't noticed much of what their child has been doing. More common, however, at least in our experience, is the child whose parent report suggests extremely advanced ability, but whose test performance is average or only slightly advanced by any of our test measures.

As long-term follow-up data from our longitudinal study begin to accumulate, we are increasingly convinced that when information from parents indicates precocity not immediately apparent on standardized tests, precocity may indeed manifest itself when the child is older and more readily testable. In our experience, bright children's test scores generally tend to increase as the children mature from fidgety or shy two- and three-year-olds into poised and gregarious four- and five-year-olds. However, the children whose scores increase the most tend to be those who were initially identified as exceptional on the basis of parent information. Within the next few months, we hope to have sufficient data to validate the trend we have already observed in a few children we retested in the Spring of 1977.

Synthesis of Parent and Test Information

Since we believe that information from parents provides a valid indication of a child's intellectual ability, we include that information when we make practical decisions, such as admitting a child to our model preschool/kindergarten program. Since both test performance and parent information are summarized in terms of points awarded for various degrees of superiority, we can and do total the points a child has earned for both kinds of information and rank applicants on this basis. Also included in the total are additional points to compensate for such biasing factors as a child's bilingualism or culturally different background. However, we do not use only this overall rank-order to select applicants. To do so would violate the "best performance" principle stated at the beginning of this paper. We also rank-order applicants on the basis of parent information only and on test performance only. Thus, a child might also be accepted in the preschool on the basis of parent information alone as well as for overall test performance, or performance on a particular type of test. So far, we have not regretted the judgments we have made in accepting children on the basis of parent information. The preschool performance of children identified on this basis has, on the whole, been just as impressive as that of children accepted on the basis of test performance.

Intellectually Advanced Preschoolers in the Classroom

As might be expected from their test scores and their parents' reports, the children attending the Child Development Preschool are a highly unusual group. In general, their intellectual behavior

in the classroom reflects a maturity that is consistent with their advanced performance as indicated by intellectual tests and/or parents' reports. Thus the preschool/kindergarten program must provide adequate resources and stimulation for children who may be reading at anywhere up to the sixth grade level, who enjoy the kinds of mathematical reasoning problems typically beyond the comprehension of children younger than elementary school age. As a group, the children are capable of more sustained involvement with intellectual activities than would be expected from children their age, they are able to grapple with sophisticated concepts, they absorb new information quickly, and they generalize their learning from one situation to another. In short, our impressions after several years of working with intellectually advanced preschoolers are that, on the whole, they display intellectual behavior which fits the stereotype of the intellectually gifted child.

However, the children also differ tremendously from one another in their particular patterns of intellectual strengths and interests. The best artists are not necessarily the most creative dramatists; the most advanced readers are not the most skilled mathematicians. Indeed, the individual differences among the children are so great that we have become uncomfortable with any generalizations about what "gifted children" are like.

The variety of the children's intellectual profiles requires the preschool staff to adapt their teaching to each individual child. The activities planned for a child who reads fluently but can barely struggle to print in block letters are very different from those offered to a child whose reading and writing skills are on a par with one

another. Children whose great strength is in verbal reasoning might be encouraged to improve the representational quality of their art work by verbalizing the details they are trying to portray, while other children might find such discussion a tedious interference with their work.

Since the children were selected only for intellectual ability, generalizations are even less appropriate when discussing their physical, social, and emotional skills. Some of the preschoolers are gracious, poised, and independent beyond their years, but advanced social maturity is by no means the norm for the group. Similarly, some of the children are advanced in motor skills, while others are functioning at the norm for their age group or are even a bit slow. Some of the children are gregarious and effective leaders, others tend to be quiet and solitary.

This observation leads to one final point about the identification of intellectually advanced children: any identification system should be tied to the program for which the children are being identified. Our program fits the children identified by our screening system and vice versa. We select children for intellectual and for academic precocity only, and our teachers enjoy the challenge of stimulating the children's intellectual growth while at the same time encouraging the development of social and physical skills. Our staff/child ratio is high enough to permit the individualized attention these children must have. If we selected a more homogeneous group, such as children with advanced academic skills and the ability to work independently, our program would be a very different one.

Any screening system must reflect the goals and practical constraints of the particular program it is designed to serve. However, we feel that the general principles expressed at the beginning of this paper should be implemented in all systems for identifying young children with advanced intellectual abilities: the child should be given diverse opportunities to display a variety of intellectual skills; the child's best, rather than average performance should be the first criterion; and, the child's parents should be encouraged to contribute their observations to the identification process.

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Table 1

Intercorrelations of WPPSI Mazes, WPPSI Block Design and Stanford-Binet IQ Scores in Three Samples of Young Children

Sample	Rank-order Correlations of Test Performance		
	Blocks-IQ	Mazes-IQ	Mazes-Blocks
Attending 1975-76 Preschool	r_s=.27 (n=16, NS)	r_s=.15 (n=16, NS)	r_s=.47 (n=16, $p<.07$)
Applicants for 1976-77 Preschool	r_s=.38 (n=14, NS)	r_s=.29 (n=13, NS)	r_s=.80 (n=11, $p<.01$)
Applicants for 1976-77 Preschool/Kindergarten	r_s=.37 (n=18, $p<.07$)	r_s=.05 (n=18, NS)	r_s=.33 (n=18, $p<.08$)

Table 2

Correspondence between Parent Report Ratings and Standard Test Performance (1976)

Frequency of Parent Report Ratings		Frequency of Test Score			
		Binet IQ		Spatial Tests	
		Low	High	Low	High
Language	Low	12	2	7	2
	High	16	9	15	6
		(n=39, p=.007[a])		(n=30, p=.33[a])	
Spatial	Low	14	9	17	2
	High	9	7	5	6
		(n=39, p=.60[a])		(n=30, p=.002[a])	

[a]Fisher's exact test

Analysis of Parent Information in the Identification of Precocious Intellectual Development in Young Children[1]

Richard Krinsky, Nancy B. Jackson and
Halbert B. Robinson

This report presents an evaluation of the reliability and concurrent validity of the most recent parent questionnaire (1977 version) designed to identify young children (aged 2 through 5 years) with advanced intellectual abilities. Successive versions of the questionnaire have been developed by staff members of the University of Washington's Child Development Research Group for use in their study of children with extraordinarily advanced intellectual abilities and in the selection of children for the model preschool/kindergarten program associated with the longitudinal study. A detailed description of the questionnaire and its use has been reported elsewhere (Jackson and Robinson, 1977).

The questionnaire evaluated here consisted of three separate parts. Part I was designed to obtain an overall evaluation of the child's intellectual precocity. The questions were of a general nature and called for parents to respond with extended, anecdotal descriptions of their child's interests and abilities. Part II of the questionnaire called for parents' best retrospective judgments as to when early milestones

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[1]The preparation of this paper was supported by grants from the Spencer Foundation and the U. S. Office of Education. The authors wish to thank Allen Edwards and Clifford Lunneborg for their advice on the analysis of the data and Charles Stillman for assistance with computer programming.

in development occurred. Questions such as "At what age (in months) did your child say his/her first words?" were followed by four response alternatives, each indicating an age range of several months. A 4-point scale was used to score responses, with 4 points given for answers in the most precocious age range. The questionnaire's Part III was designed to yield an index of the child's current ability in various areas of intellectual functioning. Answers to questions such as, "Does your child recognize and name two-digit numbers?" and "Is your child able to read a simple book, such as Hop on Pop, or other kindergarten-level books, and recognize most of the words?" were scored on a 4-point scale ranging from "yes, is able" (4 points), to "I think so" (3 points), "I don't think so" (2 points), and "no, not yet" (1 point). Objective scores for Part II and Part III of the questionnaire were derived by summing scores across the included items.

Part II: Retrospective Questions

The items for Part II of the 1977 questionnaire were adapted from a previous (1975-76) version of the questionnaire. The ages defining response categories for each of the items were derived from a review of norms in the literature and from a tally of parents' responses to the 1975-76 questionnaire.

Even though parents were encouraged to give their best estimates of when their children first demonstrated certain behaviors, in over 50% of the questionnaires one or more questions (out of a possible seven) was

left blank. A number of parents indicated that they couldn't be sure when a certain behavior occurred, but did guess at a particular age range. These responses were included in our analyses. Parents who kept baby books or diaries were able, of course, to provide more accurate information. In this sample, however, very few of the parents reported that they had kept a log of their child's early development.

Parents' responses to Part II of the questionnaire are summarized in Table 1.

Insert Table 1 here

Most parents in the sample (n=50)[2] reported that their children were either precocious or advanced in their early development. While many parents also provided some useful and interesting anecdotal material about their child's early development, objective responses to the various items appeared unrelated to other measures of interest. For example, the correlation of the parents' estimates of their child's early development (Part II scores) with their judgments of their child's current accomplishments (Part III scores) was +.15 (Spearman rho, n=50, NS).[3] The correlation between

[2]Sample based on 1977 preschool and kindergarten applicants. All children with questionnaires with more than one blank response in the Part II section (n=23) were omitted from this analysis.

[3]Since Part III scores were highly correlated with age, scores for this and other analyses were converted to T Scores (see Edwards, 1961, pp. 111-113). The norms are given in Table 2.

Table 1

Parents' Responses to Retrospective Questions about Their Child's Development

(1977 Questionnaire, Part II, n=50)

Part II Item	Median Age in Months
1. At what age (in months) did your child say his/her first words?	10
2. At what age did your child first put together two words to form a simple sentence such as "more milk," "daddy go," etc.?	13
3. When was your child able to point to at least three body parts such as hair, mouth, hands, ears, toes, etc. when asked to do so?	13
4. At what age did your child first have a vocabulary of about 50 words?	21
5. When did your child first begin to ask for the names of everyday objects by pointing at something and saying "What's that?"	25
6. At what age was your child first able to draw or copy a circle?	26
7. At what age did your child first put together puzzles of six or more pieces in which the pieces were all part of the same picture?	26

Part II scores and short-form (starred items only) Stanford-Binet IQ (Terman and Merrill, 1973) was -.05 (n=53, NS),[4] and the correlation between Part II scores and a weighted summary of performance on the Stanford-Binet and other specific ability tests was -.03 (n=53, NS).

The results of these analyses indicate that parents' retrospective judgments of when early developmental milestones occurred do not contribute to the prediction of a child's current intellectual capabilities. Such questions do, however, yield interesting anecdotal reports of the children's early development.

Part III: Current Accomplishments

Scores for Part III of the parent questionnaire were obtained by summing across different items within each of six intellectual domains. Items were classified for analysis under language, memory, conceptual understanding, spatial/perceptual reasoning, reading and mathematical ability. Classifications were determined on the basis of the model judgment of a group of psychology faculty and graduate students. On the questionnaire itself, questions were arranged in random order to discourage halo effects in parents' responses.

Most of the items in Part III were selected from the 1975-76 questionnaire. Only those items which had a low to moderate frequency of positive responses and specified behaviors which could easily be observed by parents were retained in the revised, 1977, questionnaire. Since these items were age related, older children were expected to achieve higher total scores, and that was the case. The correlation

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[4]Unless otherwise reported, correlations are Spearman rho.

between the child's age (at the time of parents' response to the questionnaire) and Part III raw scores was +.84 (n=73, p<.001).[5]

Table 2 summarizes Part III scores by age groups.

Insert Table 2 here

The project staff predicted that the objective questionnaire responses of parents which were concerned with their child's current ability (Part III scores) would relate to a weighted composite of test performance measures (Jackson & Robinson, 1977). This year's results were moderately encouraging. The correlation between Part III scores and summary test performance scores was +.48 (n=56, p<.001).[6]

All items in Part III had a section for comments, and parents were encouraged to provide anecdotes and examples of their child's demonstrated abilities. Over the past several years the project staff has become increasingly impressed by the ability of parents to provide descriptive information which is useful in formulating judgments about a child's intellectual precocity. Often a simple question such as "Does your child recognize and name two-digit numbers?" has yielded additional information regarding the extensiveness of the child's demonstrated ability in number recognition. This type of information has been helpful in rating the child's precocity in various intellectual domains.

[5]All 1977 preschool and kindergarten applicants (n=73) were included in the analysis.

[6]All children with Stanford-Binet tests rated as detrimental by the tester (n=7) were omitted from the analysis.

Table 2

Normative Scores for Preschool and Kindergarten Applicants

(1977 Questionnaire, Part III Total Scores, n=73)

Age of Group	N	Mean Total Score	Standard Deviation
1-7 to 2-6	18	61.44	15.87
2-7 to 2-11	21	76.67	15.87
3-0 to 3-11	16	92.31	17.44
4-0 to 4-6	10	112.00	10.24
4-7 to 5-6	8	121.13	9.14
Total	73		

Note: Means obtained from total scores derived from response to 34 items across six intellectual domains.

Rating of Questionnaire Responses

Two independent raters (a graduate research assistant in developmental psychology and an undergraduate psychology major) rated each of 73 questionnaires on a 3-point scale ranging from average (0 points) to advanced (1 point) and extraordinarily precocious (2 points). Tests of inter-rater reliability for ratings of the 73 questonnaires from applicants to the 1977-78 preschool-kindergarten program are summarized in Table 3.

Insert Table 3 here

The overall inter-rater reliability across the six domains was at a level which is well within the acceptable range for this type of judgment (rho=.70, n=53, p<.001). However, the inter-rater reliabilities for individual subscales, particularly language ability, spatial ability, and conceptual ability, were lower than anticipated, as indicated in Table 3.

The reliability of the rating system was also evaluated by looking at the percentage of agreement between judges for rating each category. In 67% of the judgments the two independent raters were in perfect agreement. In 32% of the judgments the raters used adjacent categories, and in 1% of the judgments the raters were in maximal disagreement. That is, in only 4 of the 438 comparisons did one rater rate the child as exceptional while the other rated the child as average.

Ratings reflected parents' objective responses to Part III of the questionnaire. The Spearman rank-order correlation between objective

Table 3

Inter-rater Reliability for Evaluators
of Parent Questionnaire Responses in Six Intellectual Domains

Intellectual Domain	Correlation Coefficients[a]
Mathematical Ability	.73
Reading Ability	.67
Spatial Ability	.45
Conceptual Ability	.48
Memory Ability	.53
Language Ability	.54
Mean Category Reliability	.54

[a]Kendall tau, n=73, preschool and kindergarten applicants, all p<.001.

score totals for Part III and rating scores was .67 (n=64, p<.001). However, the ratings did not reflect objective answers to the retrospective questions in Part II (rho=.08, n=50, NS). Thus it is reasonable to assume that any improvement in the predictive validity of the ratings over objective Part III scores is attributable to use of the anecdotal information and comments which parents supplied on all three parts of the questionnaire.

The correlation between questionnaire rating scores and a summary score for test performance was .56 (Spearman rho, n=53, p<.001) for those children whose test sessions were rated adequate or better by the tester. The predictive power of this measure was greater than that of any other measure extracted from the parent questionnaire.

Summary and Suggestions for Future Research

In summary, it appears that both rating point scores and objective scores obtained from Part III of the Parent Questionnaire were moderately good predictors of summary test performance scores. However, objective responses to retrospective questions regarding early milestones in development (Part II) did not contribute information useful in the prediction of intellectual precocity. Such questions will not be included in future questionnaires. Data supporting these conclusions are summarized in Table 4.

Insert Table 4 here

The results of these analyses of the 1977 questionnaire will

Table 4

Summary Correlation Matrix

(1977 Parent Questionnaire)

	Age at Time of Questionnaire	Total Part II Scores	Total Part III Scores	Rating Point Scores
Total Part II Scores	.13			
Total Part III Scores	.07	.15		
Rating Point Scores	.23	.08	.67*	
Total Summary Test Points	.34	-.03	.48*	.56*

*p<.001

influence the revision of the questionnaire into a new form to be distributed to parents joining the longitudinal sample in 1978. At this time we are planning to focus our efforts on increasing the reliability of the rating procedure and refining those items dealing with the child's current accomplishments (Part III).

We have conducted a number of preliminary analyses which we plan to replicate next year. For example, the results of a factor analysis (principal components analysis, varimax rotation), of Part III items did not support the existence of intellectual domains. Many of the items in Part III loaded on a single dimension with age as a variable, not an unreasonable finding with an instrument such as this. There were, however, several problems in this analysis which may have influenced the results. One problem was that there were an unequal number of items in each of the proposed categories. Also, the degree of parental certainty varied across the different hypothesized dimensions. These problems will be taken into consideration as the questionnaire is revised.

Another, initially more fruitful, type of analysis has been to test whether sets of logically related items form a Guttman Scale (Edwards, 1957). When the mathematics and reading categories were scaled, the results indicated that the mathematics questions formed a Guttman Scale, while the reading questions did not. There were problems in the questionnaire design which may have contributed to this result with the reading items. There was, for example, some ambiguity in the manner in which several reading questions were formulated; sixteen parents answered "yes" to a more advanced question dealing with reading level, while only eleven parents answered "yes" to a less advanced question. These problems should be alleviated by a more precise formulation of individual items.

During next year's ratings of the Parent Questionnaire we hope to increase the inter-rater reliability. Raters will be trained more extensively, and rating scale values will be illustrated with specific examples of behaviors consistent with that rating.

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APPENDIX C

Problems in the Assessment of Social-Emotional Development in Intellectually Advanced Preschool Children

Wendy C. Roedell

Problems in the Assessment of Social-Emotional Development in Intellectually Advanced Preschool Children[1]

Wendy Roedell

The assessment of social skills is of primary importance in our attempts to define and describe the characteristics of intellectually advanced children. Many checklists for identifying "gifted" children include statements about social behavior which are based on the belief that children with advanced intellectual abilities should also demonstrate advanced degrees of social maturity. The question of social maturity becomes crucial when decisions are to be made about school placement. In determining whether an intellectually advanced four-year-old, for example, is a good candidate for early entrance to kindergarten, it is not sufficient to know that the child's academic skills are at an advanced level. One must also make some prediction about how the child will function as a social and emotional being in the context of the kindergarten classroom.

Unfortunately, in our attempts to obtain meaningful answers to questions about the social maturity of the children in our study, we have become certain about only one thing--it is much easier to measure intellectual and academic skills in young children than to measure social ones. Our limited

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[1]This paper is based on a talk presented at the Fifth Annual Pacific Northwest Research and Evaluation Conference, Washington Educational Research Association, Seattle, Washington, May 1977, as part of the symposium Assessment of advanced intellectual abilities of young children, chaired by H. B. Robinson.

experience substantiates the conclusions of a large-scale study designed to evaluate measures used in assessing the nationwide Head Start Planned Variations Program. In that study, researchers from the Huron Institute (Walker, Bane, & Bryk, 1973), concluded that there are no measures in the areas of social and emotional growth which are adequate for evaluation programs for young children.

During the past two years we have tried several different approaches to looking at children's social development. We have gathered information from parents through interviews and questionnaires; we have collected ratings and questionnaire information from our preschool teachers; and we have used a case study approach based primarily on teachers' informal observations of children's behavior.

Information gathered from these different sources frequently seems to be inconsistent. Either children behave differently in different situations, or similar behaviors are perceived differently by different people. In addition, an analysis of these different measures reveals tremendous variability in the social skills and personal attributes of the intellectually advanced children in our sample. No general profile of characteristics which might be used to describe a typical "gifted child" has emerged. In many individual cases, real discrepancies have been noted between the children's level of intellectual development and their level of social development. It is not uncommon for a three-year-old who reads at the third grade level to throw frequent tantrums and have difficulty making friends with other children. A more detailed description of our attempts to measure social and personality attributes follows.

Parent Questionnaires

In 1974-75, a questionnaire was sent to parents of children entering the study. The questionnaire was based on the Alpern and Boll Developmental Profile (Alpern & Boll, 1972), and included yes/no questions related to children's social development. The questionnaire was scored in terms of a social quotient, based on normative data collected on a standardization sample of same-age children. In addition, parents were asked during an interview to rate their children on a five-point scale for each of eight global personality characteristics. We asked: (1) How demanding is your child? (2) How stubborn? (3) How independent? (4) How happy? (5) How curious? (6) How active? (7) How bossy? (8) How intense?

The results of these efforts were discouraging. There was no relationship between the social maturity measure and any of the parent ratings of their child's personality. Nor was there any relationship between any of these measures and the child's Stanford-Binet IQ.

Teacher Ratings

We next decided to see how teachers in our preschool regarded these children, and to compare the teachers' view with that of the parents. Teachers were asked to rate children on each of the same global personality measures--demanding, stubborn, independent, curious, active, bossy, intense. At the same time, teachers were asked to complete the California Preschool Social Competency Scale (Levine, Elsey, & Lewis, 1969) for each child. This scale is designed to evaluate the social competence of children aged 2 years, 6 months through 5 years, 6 months. Its norms are based on teachers' ratings of children within this age range who are attending preschool or nursery

school programs. The scale consists of thirty items representing a wide range of behaviors, such as response to routine, following instructions, sharing, helping others, initiating activities, and so on. Each item contains four descriptive statements representing varying degrees of competence relative to the behavior in question. Answers are to be based on the teachers' cumulative observations of the child.

Again, results were discouraging. There seemed to be no relationship between information about social maturity coming from parents and information coming from teachers. There were no significant correlations, for example, between parents' and combined teachers' responses to any of the personality ratings. Neither was there a significant correlation between the general social maturity parent questionnaire measure and the children's scores on the California Preschool Social Competency Scale.

These findings are perhaps not particularly surprising. It is not unlikely that children actually behave differently at home than they do at school. Many a parent has had the experience of listening to a teacher or a neighbor praise their child's model behavior, and wondering why they have seen so few examples of such behavior at home. In addition, when parents are asked to use rating scales, there is no check on reliability. The ratings on each child come from a different individual parent or set of parents. Each parent may use slightly different criteria to form the rating, making comparisons among children virtually meaningless.

We did expect, however, to find greater consistency among teachers' ratings of the same children than turned out to be the case. Six teachers were involved in the global personality ratings. Spearman rank order correlations between pairs of teachers rating the same children on each

personality trait ranged from -.06 to +.85. Similarly, correlations between pairs of teachers rating children on the California Preschool Social Competency Scale ranged from zero to +.92.

Recent Teacher Ratings

During the 1976-77 school year we asked the two head teachers to rate children on the Social Competency Scale in the fall and again in the spring. Reliability in the fall was too low to be of use; the Kendall coefficient was a mere .46. When teachers rated children in the spring, however, reliability was much higher (the Kendall coefficient was +.73 for raw scores and .68 for percentile scores), reflecting both increased experience with the children and intensive discussion of the scale items. With these coefficients, it seems reasonable to use an average of the teachers' ratings as a descriptive measure of social competence in our preschool sample. Doing this, the range of average social competency scores was as great as one might find in any unselected group of preschool children. Children scored from the 15th percentile to the 98th percentile, as compared with the national standardization sample. Children's levels of social competence was related to their degree of intellectual advancement. The Spearman rank order correlation between Stanford-Binet IQ and percentile rank on the Social Competency Scale was .61. This indicates that about one third of the variance in teachers' ratings of social competence was accounted for by those cognitive skills measured by the Stanford-Binet, leaving two thirds of the variance unrelated to such intellectual skills.

Best vs. Typical Performance

Despite the relative success of this final effort to collect some data on children's social development, the fact remains that measurement in this area is far from a desirable level of precision and reliability. The basic problem of inconsistent findings lies in the nature of the task of assessing social development. In our assessment of intellectual development in young children, we have attempted to discover optimum situations which will allow each child to show us his or her best performance. We want to know what the child is capable of doing, given ideal conditions. The problem in assessing social skills is very different. For most purposes, the intent is to assess the child's typical performance in a variety of situations. We try to predict how a child is likely to behave--to make some sort of probability statement about the child's behavior, rather than to assess an absolute level of competence. The probability of any particular behavior occurring in a particular setting depends to a large extent on the circumstances in that setting. In most cases, children are likely to perform behaviors which are rewarding for them. The intellectually advanced child, for example, who is bored by the activities of the regular classroom, may be inattentive, listless, or possibly disruptive. There is little intrinsic motivation for such a child to attend to a lesson that is already fully comprehended. Placed in a more challenging situation, the same child may become deeply involved, eager, and attentive. We have observed this phenomenon in our own preschool classroom. Ratings of such a child taken by individuals who had observed one of the above situations would be expected to differ radically from ratings based on experience in the other situation.

Instead of assessing a child's general level of "social maturity," it may be more meaningful to define which behaviors are required for success in particular settings, and to observe the child in those settings. An interview with a strange adult, for example, is hardly likely to provide a good index of how a child will behave with classroom peers. Children behave very differently in a strange situation than in a familiar one. Parents of one five-year-old child in our research sample, for instance, reported that he was asked to "sit in" on a first grade class, to see "how well he would fit." The child was judged socially immature when he failed to rush out to the playground with the other children at recess. Children do take time to become comfortable with classroom routines.

For practical pedagogical purposes, we have found it useful to collect concrete descriptions from each teacher about what they have observed children doing in different situations. Instead of labeling children, we try to determine under what conditions a child is likely to be attentive or disruptive, aggressive or cooperative, and so on. We can then attempt to structure classroom situations which will be most likely to elicit constructive behavior from each child.

In our continuing research efforts, we have begun to collect formal observations of children's social behavior in free play settings. We are also administering the Preschool Interpersonal Problem Solving Test--PIPS Test (Spivack & Shure, 1974). During this test, a child is presented with concrete social conflict situations, and asked to generate solutions to these conflicts. The test has been reported to relate to children's classroom behavior (Spivack & Shure, 1974). We will attempt to validate this finding on our sample of children by relating their responses to their observed

classroom behavior. In addition, we will administer the PIPS Test to the matched control group chosen from children who applied to the preschool program and qualified, but did not attend. These measures will be repeated on both preschool and control group children in the spring to provide a check on the effect of the preschool experience on the acquisition of specific social skills. We hope that specific definitions of children's behavior coupled with specific definitions of settings may help reduce the unreliability of more global measures of social functions.

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